

DICHIARAZIONI SOSTITUTIVE DI CERTIFICAZIONI

(art. 46 D.P.R. n. 445/2000)

DICHIARAZIONI SOSTITUTIVE DELL'ATTO DI NOTORIETÀ

(art. 47 D.P.R. n. 445/2000)

Il sottoscritto

COGNOME _____ MASTRO _____
(per le donne indicare il cognome da nubile)

NOME _____ PIETRO _____

NATO A: _____ PROV. _____

IL _____

ATTUALMENTE RESIDENTE A: _____

_____ PROV. _____

INDIRIZZO _____ C.A.P. _____

TELEFONO _____

Visto il D.P.R. 28 dicembre 2000, n. 445 concernente "T.U. delle disposizioni legislative e regolamentari in materia di documentazione amministrativa" e successive modifiche ed integrazioni;

Vista la Legge 12 novembre 2011, n. 183 ed in particolare l'art. 15 concernente le nuove disposizioni in materia di certificati e dichiarazioni sostitutive (*);

Consapevole che, ai sensi dell'art.76 del DPR 445/2000, le dichiarazioni mendaci, la falsità negli atti e l'uso di atti falsi sono punite ai sensi del Codice penale e delle leggi speciali vigenti in materia, dichiara sotto la propria responsabilità:

**che quanto dichiarato nel seguente curriculum vitae et studiorum
comprensivo delle informazioni sulla produzione scientifica
corrisponde a verità**

Curriculum vitae et studiorum

studi compiuti, i titoli conseguiti, le pubblicazioni e/o i rapporti tecnici e/o i brevetti, i servizi prestati, le funzioni svolte, gli incarichi ricoperti ed ogni altra attività scientifica, professionale e didattica eventualmente esercitata **(in ordine cronologico iniziando dal titolo più recente)**

Titoli Accademici e Professionali

Nr 1
Descrizione del titolo: Borsa di Dottorato di Ricerca Triennale (MIUR) in Ingegneria per l'Innovazione e lo Sviluppo Sostenibile (XXXV ciclo)
Ente: Università degli Studi della Basilicata (UNIBAS)
Decreto n. 469 del 30 Settembre 2019
- Attività svolta: L'obiettivo generale del progetto di dottorato ha riguardato lo studio e sviluppo di algoritmi avanzati basati sull'intelligenza artificiale (AI) per il recupero di parametri geofisici dell'atmosfera e della superficie terrestre da osservazioni satellitari delle missioni Copernicus e MetOp operanti nelle bande dell'infrarosso e delle microonde. In particolare, per quanto concerne l'utilizzo dei sensori della piattaforma MetOp (IASI, AMSU, MHS, ecc.) lo studio ha riguardato la progettazione, la prototipazione e la convalida di algoritmi AI di regressione di parametri microfisici delle nubi quali i profili verticali dei contenuti di acqua liquida e ghiacciata, i corrispettivi contenuti colonna, e i raggi efficaci di caduta delle nubi. Per quanto riguarda i sensori della missione Copernicus lo studio ha investigato le potenzialità di indici incoerenti e coerenti di "Change Detection" (CDI) per il rilevamento e il monitoraggio di cambiamenti della superficie terrestre mediante l'analisi di sequenze di immagini radar ad apertura sintetica (SAR) acquisite dai sensori Sentinel-1 A e B. In questo contesto, è stata valutata l'efficacia e l'utilità di algoritmi di AI di gestire queste informazioni in un corpus unico e di produrre mappe di cambiamento di aree osservate a

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valle di eventi disastrosi (per esempio, incendi, inondazioni). Infine, una serie di esperimenti, studi ed un'ampia dissertazione sulle problematiche relative all'interferometria SAR differenziale, nonché lo studio di grandi deformazioni della superficie terrestre sfruttando e adattando opportunamente la metodologia nota in letteratura come "Multiple Aperture Interferometry" (MAI), sono stati presentati e discussi.
Periodo di fruizione: dal 1 Novembre 2019 (in corso)

Nr 2
Descrizione del titolo: Tirocinio formativo e di orientamento/premio di Laurea
Ente: Istituto per il Rilevamento Elettromagnetico dell'Ambiente (IREA-CNR)
Bando n. 126.273.PL.001 del 26/01/2018
<ul style="list-style-type: none"> - Tematica: "Studio e Sviluppo di Algoritmi per l'Elaborazione di Segnali Radar ad Apertura Sintetica" - Attività svolta: Studio e sviluppo di algoritmi per l'elaborazione di segnali RADAR ad apertura sintetica (SAR), nell'ambito del progetto ESA-CNR intitolato "Integrated analysis of the combined risk of rising sea levels of abandonment and structural risks in coastal regions delta (INUNDATE)".
Periodo di attività: 3 Dicembre 2018 – 26 Luglio 2019

Nr 3
Descrizione del titolo: "Participation to the ESA/MOST China Dragon 4 cooperation as a young scientist"
Ente: European Space Agency (ESA)
Ref. ESA-EOP-SD-LE-0244
Attività svolta: Contributo attivo all'iniziativa congiunta dell'Agenzia Spaziale Europea (ESA) e del Ministero della Scienza e della Tecnologia cinese (MOST) Dragon IV, progetto (ID. 32294) che è stato esplicitamente concepito per affrontare la questione del monitoraggio delle regioni costiere e dei delta fluviali attraverso le tecnologie di Osservazione della Terra (EO).
Periodo di attività: da Gennaio 2019 a Luglio 2021

Nr 4
Descrizione del titolo: Abilitazione alla professione di Ingegnere Informatico
Classe: 35/S
Data di conseguimento: 16 Giugno 2021

Nr 5
Descrizione del titolo: Laurea Magistrale in Ingegneria Informatica e delle Tecnologie dell'Informazione
Classe di Laurea: LM-32 - Classe delle lauree magistrali in Ingegneria informatica di cui al D.M. 270/2004
Voto: 110/110 Lode
Ente: Università degli Studi della Basilicata (UNIBAS)
REG. N.: 1/1/LM
FOGLIO N. 20
NUMERO: 1039
<ul style="list-style-type: none"> - Descrizione: Laurea Magistrale in Ingegneria Informatica e delle Tecnologie dell'Informazione conseguita presso l'Università degli Studi della Basilicata. - Titolo della tesi: Sviluppo di algoritmi InSAR per lo studio di Deformazioni della Superficie Terrestre di Grandi Dimensioni: la tecnica Multiple Aperture Interferometry (MAI) (relatori: Ch.mo prof. Carmine Serio, Dott. Antonio Pepe) - Attività svolta: Il progetto di tesi sperimentale ha avuto come obiettivo lo sviluppo di algoritmi per lo studio di medie/grandi deformazioni della superficie terrestre attraverso la tecnica nota in letteratura come Multiple Aperture SAR Interferometry (MAI). Lo studio ha riguardato l'applicazione della suddetta tecnica a dati SAR di prima generazione e si è considerata l'area di studio della depressione di Afar in Etiopia. In particolare, a partire da una serie di immagini acquisite dal sensore SAR ENVISAT/ASAR dell'Agenzia Spaziale Europea (ESA) l'applicazione della tecnica ha permesso di determinare una sequenza di interferogrammi MAI dalla quale è stato possibile ottenere le serie storiche e le mappe di velocità media di deformazione dell'area osservata.
Data di conseguimento: 28 Febbraio 2019
Periodo di attività: 1 Settembre 2016 – 28 Febbraio 2019

Nr 6
Descrizione del titolo: Laurea Triennale in Scienze e Tecnologie Informatiche
Classe di Laurea: L-31 - Classe delle lauree in Scienze e tecnologie informatiche di cui al D.M. 270/2004
Voto: 103/110
Ente: Università degli Studi della Basilicata (UNIBAS)
REG. N.: 1/S/L
FOGLIO N. 69
NUMERO: 1032
<ul style="list-style-type: none"> - Descrizione: Laurea Triennale in Scienze e Tecnologie Informatiche conseguita presso l'Università degli Studi della Basilicata. - Titolo della tesi: Sviluppo di un Algoritmo per il Riconoscimento di Target Distribuiti (DS) in Sequenze di Interferogrammi SAR (relatore: Dott. Antonio Pepe) - Attività svolta: Il progetto di tesi ha riguardato lo studio di alcune tecniche di elaborazione di segnali radar SAR ed in particolare al monitoraggio della superficie terrestre per l'analisi delle deformazioni del terreno tramite algoritmi di tipo interferometrico differenziale. In particolare, è stato sviluppato un algoritmo di filtraggio del rumore interferometrico che opera su una sequenza

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di interferogrammi SAR differenziali, mediante l'utilizzo opportuno di indici di statistica direzionale e l'identificazione di pixel statisticamente omogenei.
Data di conseguimento: 23 Marzo 2016
Periodo di attività: 14 Settembre 2011 – 23 Marzo 2016

Nr 7
Descrizione del titolo: Diploma di Perito Ragioniere Programmatore (voto 72/100)
Titolo: Diploma di Perito Ragioniere Programmatore presso l'istituto d'Istruzione Secondaria Superiore Camillo d'Errico di Palazzo San Gervasio, PZ, 85026
Data di conseguimento: 11 Luglio 2011
Periodo di attività: 1 Dicembre 2006 – 11 Luglio 2011

Ulteriore Formazione

Nr 8
Descrizione del titolo: Seminario IEEE Geoscience and Remote Sensing South (GRSS) Italy Chapter
<ul style="list-style-type: none"> - Descrizione: Partecipazione al seminario "SAR Polarimetry: Theory, Machine Learning & Applications" indetto e organizzato dall'IEEE GRSS South Italy Chapter. - Presentatore: Prof. Carlos Lopez-Martinez, Universitat Politècnica de Catalunya-BarcelonaTech. - Chair: Prof. Antonio Iodice, Università degli Studi di Napoli Federico II, Dipartimento di Ingegneria elettrica e delle Tecnologie dell'informazione. - Luogo: partecipazione virtuale da remoto. - Attività svolta: L'obiettivo di questa seminario è stato fornire un'introduzione sostanziale ed equilibrata alla teoria, ai concetti di scattering, ai sistemi e ai concetti avanzati e alle applicazioni tipiche della polarimetria SAR (PolSAR). Gli argomenti trattati sono: teoria, modellazione dello scattering, rappresentazione dei dati, decomposizione dei target, filtraggio speckle, classificazione del terreno e dell'uso del suolo, analisi dei target artificiali, applicazione di modelli basati sul machine learning (ML), ecc.
Periodo di fruizione: 19 Ottobre 2021

Nr 9
Descrizione del titolo: Summer School
<ul style="list-style-type: none"> - Descrizione: Partecipazione alla summer school Solar Radiation Based Established Techniques for aTmospheric Observation (SORBETTO) - Link: http://sorbetto2.artov.isac.cnr.it/ - Luogo: ISAC-CNR e Università Sapienza sede di Roma, Italia. - Attività svolta: Studio di tecniche basate sulla misurazione da terra della radiazione solare per la stima quantitativa dei principali aerosol e gas atmosferici e l'analisi delle loro proprietà.
Periodo di fruizione: 13 Settembre 2021 – 15 Settembre 2021

Nr 10
Descrizione del titolo: Summer School
<ul style="list-style-type: none"> - Descrizione: Partecipazione alla InnEO Summer School - Link: https://inneospace.eu/inneo-school/ - Luogo: R&D Institute of Transilvania University, Braşov, România. - Attività svolta: Studio delle più recenti tecniche e modelli di intelligenza artificiale (e.g., reti neurali feed-forward, convoluzionali, ecc...) applicate nell'ambito dell'osservazione della terra (EO). Sviluppo e acquisizione di competenze nella gestione di progetti di ricerca, in materia di integrità ed etica della ricerca, competenze in materia di comunicazione, gestione e risoluzione dei problemi, diritti di proprietà intellettuale e competenze legali.
Periodo di fruizione: 19 Luglio 2021 – 24 Luglio 2021

Nr 11
Descrizione del titolo: Seminario Center of Excellence Telesensing of Environment and Model Prediction of Severe events (CETEMPS)
<ul style="list-style-type: none"> - Descrizione: Partecipazione al seminario "Elevation-dependent warming and climate change in mountain areas: strengths and Uncertainties" organizzato e indetto dal CETEMPS - Relatore: Elisa Palazzi (CNR-ISAC) - Luogo: partecipazione virtuale da remoto.
Periodo di fruizione: 02 Luglio 2020

Nr 12
Descrizione del titolo: Seminario Center of Excellence Telesensing of Environment and Model Prediction of Severe events (CETEMPS)
<ul style="list-style-type: none"> - Descrizione: Partecipazione al seminario "The Italian radar network in the framework of the national Early Warning System" organizzato e indetto dal CETEMPS - Relatore: Gianfranco Vulpiani (Presidenza CdM – DPC) - Luogo: partecipazione virtuale da remoto.
Periodo di fruizione: 04 Giugno 2020

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Nr 13
Descrizione del titolo: Seminario Polimi
<ul style="list-style-type: none"> - Descrizione: Partecipazione al seminario "URBAN GEO BIG DATA" indetto e organizzato dal Politecnico di Milano nell'ambito della Milano Digital Week. - Luogo: partecipazione virtuale da remoto. - Attività svolta: L'obiettivo di questo seminario è stato fornire un'introduzione all'utilizzo delle moderne osservazioni satellitari per il monitoraggio del suolo in grandi aree urbanizzate e l'analisi della mobilità cittadina sfruttando la sensoristica di bordo dei veicoli. Sono state inoltre presentate le più recenti tecnologie open source per la modellazione 3D dell'ambiente urbano e la visualizzazione di grandi moli di dati geografici attraverso portali web immersivi.
Periodo di fruizione: 28 Maggio 2020

Nr 14
Descrizione del titolo: Seminario Center of Excellence Telesensing of Environment and Model Prediction of Severe events (CETEMPS)
<ul style="list-style-type: none"> - Descrizione: Partecipazione al seminario "Cicloni con caratteristiche tropicali nel Mediterraneo (Medicanes)" organizzato e indetto dal CETEMPS - Relatore: Mario Marcello Miglietta (ISAC-CNR) - Luogo: partecipazione virtuale da remoto.
Periodo di fruizione: 21 Maggio 2020

Nr 15
Descrizione del titolo: Seminario del Dipartimento di Scienze del Corso di Laurea Magistrale in Farmacia dell'Università degli Studi della Basilicata
<ul style="list-style-type: none"> - Descrizione: Partecipazione al seminario "Le personal e professional skills in ambito universitario" organizzato e indetto dal Dipartimento di Scienze del Corso di Laurea Magistrale in Farmacia dell'Università degli Studi della Basilicata - Relatore: Dott. Alessio Spataro - Luogo: Dipartimento di Scienze, Università degli Studi della Basilicata, via dell'Ateneo Lucano, Potenza, 85026
Periodo di fruizione: 9 Dicembre 2019

Partecipazione a progetto scientifico o a campagna di rilevamento, partecipazione ad unità operativa all'interno di un progetto

Nr 16
Ruolo svolto: Partecipante unità operativa UNIBAS
Titolo progetto: ComboCloud
Descrizione del titolo/finanziamento: Progetto finanziato dall'European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), Ref: EUMETSAT ITT 19/218285 Contract: EUM/CO/19/4600002352/THH Order n°. 4500019043
Importo totale finanziamento 150000,00 euro
Nominativo coordinatore del progetto: Filomena Romano CNR-IMAA
Altri partner italiani o stranieri del progetto: CNR-IMAA
Finalità del progetto: The overall objective of the study Combined MWS and IASI-NG Soundings for Cloud Properties (ComboCloud) was to specify, prototype and validate algorithms for the retrieval of cloud microphysical properties from the synergy of passive Microwave (MW) and hyperspectral infrared (IR) observations. The key cloud parameters addressed by ComboCloud are the vertical profiles of cloud liquid and ice water contents, cloud liquid and ice water paths, cloud drop effective radius, and finally a thin cirrus detection flag. Specific objectives were: <ol style="list-style-type: none"> 1. Exploit IASI-NG/MWS synergy for the retrieval of cloud products currently not available from EPS sensors: <ul style="list-style-type: none"> • Cloud Liquid Water Content (CLWC) • Cloud Ice Water Content (CIWC) • Cloud Liquid Water Path (CLWP) • Cloud Ice Water Path (CIWP) 2. Investigate the benefits of future IASI-NG with respect to current IASI for the retrieval of: <ul style="list-style-type: none"> • Cloud effective radius (Re) • Thin cirrus detection 3. Adapt the algorithms to work with current EPS sensors, i.e. AMSU/MHS and IASI. 4. Validate the retrievals against existing products from other space-borne sensors.
Periodo di attività dal 3 Dicembre 2019 al 23 Novembre 2021
Attività svolta e risultati ottenuti: Sviluppo di codici relativi ai Task 2,3 e 4 e prototipazione e validazione di algoritmi di inversione basati sull'intelligenza artificiale dei Work Package (WP) 2.1, 2.2, 2.3, 2.5, 3.1, 3.2, 4.1 e 4.2
Pagina web del Progetto: https://www.eumetsat.int/combocloud
La partecipazione attiva al progetto ha condotto alla pubblicazione dei seguenti articoli: <ol style="list-style-type: none"> 1. Mastro P., Cimini D., Romano F., Ricciardelli F., Di Paola F., Masiello G., Serio C., "On the synergic use of satellite

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	microwave and infrared measurements for the estimation of effective radius of ice and liquid water clouds: a regression approach based on random forests" Proc. SPIE 12265, Remote Sensing of Clouds and the Atmosphere XXVII, 6 Sep, 2022.
2.	Mastro P. , Cimini D., Romano F., Ricciardelli F., Di Paola F., Hultberg T., August T., Serio C., Masiello G., "On the estimation of key Cloud Parameters from Satellite: an Artificial Intelligence-based retrieval framework", proceedings of International Radiation Symposium, 4 – 8 July, 2022, Thessaloniki, Greece.
3.	Mastro P. , Masiello G., Cimini D., Romano F., Ricciardelli F., Di Paola F., Hultberg T., August T., Serio C., "IASI-NG estimation of effective radius for ice and liquid water clouds: a regression approach based on Random Forests", proceedings of Living Planet Symposium, 23 – 27 May, 2022, Bonn, Germany.
4.	Mastro P. , Masiello G., Serio C., Cimini D., Ricciardelli E., Di Paola F., Hultberg T., August T., Romano F., "Combined IASI-NG and MWS Observations for the Retrieval of Cloud Liquid and Ice Water Path: A Deep Learning Artificial Intelligence Approach," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 15, pp. 3313-3322, 2022, doi: 10.1109/JSTARS.2022.3166992.
5.	Mastro P. , G. Masiello, D. Cimini, F. Romano, E. Ricciardelli, F. Di Paola, T. Hultberg, T. August, C. Serio, "Cloud liquid and ice water content estimation from satellite: a regression approach based on neural networks", Proc. SPIE 11859, Remote Sensing of Clouds and the Atmosphere XXVI, 118590H; http://doi.org/10.1117/12.2600124 , 12 Sep, 2021.

Nr 17
Ruolo svolto: Partecipante come young scientist ESA
Titolo progetto: Integrated Analysis of the Combined Risk of Ground Subsidence, Sea Level Rise, and Natural Hazards in Coastal and Delta River Regions (INUNDATE)
Descrizione del titolo/finanziamento: Progetto finanziato dall'European Space Agency (ESA) e dal Ministry of Science and Technology (MOST) of China Project id: ESA-MOST 32294
Importo totale finanziamento 65000,00 euro
Nominativo coordinatore del progetto: Antonio Pepe CNR-IREA
Altri partner italiani o stranieri del progetto: College of Geography Sciences, East China Normal University, Shanghai, China, Nanjing university of information science and technology, China
Finalità del progetto: The Dragon 4 cooperation focused on the scientific exploitation of ESA, ESA Third Party Missions, Copernicus Sentinels and Chinese EO data for geo-science and applications development. There were 8 topics including CAL / VAL, that addressed information provision for key societal issues facing Europe and China today. The fourth phase in the cooperation brought together 28 joint Sino-European teams to investigate the following topics using EO data from 30 satellite missions:
<ol style="list-style-type: none"> 1. Atmosphere, climate & carbon cycle 2. Agriculture, food & water 3. Urbanization & smart cities 4. Ecosystems including forest and grasslands 5. Oceans & coastal zones 6. Solid earth & associated disaster risk reduction 7. Hydrology and cryosphere 8. Calibration/validation.
Periodo di attività da Gennaio 2019 a Luglio 2021
Attività svolta e risultati ottenuti: Studio, analisi e sviluppo di codici relativi ai Task annuali del progetto
Ref: ESA-EOP-SD-LE-0244

Attività didattica, di diffusione scientifica e di formazione dei giovani alla ricerca, svolta sia a livello nazionale che internazionale. Incarichi di docenza in corsi di alta formazione: corsi universitari, corsi di Master, corsi di Specializzazione

Nr 18
Titolo del corso: Corsi di studio della Scuola di Ingegneria dell'Università degli Studi della Basilicata
Ente: Università degli Studi della Basilicata
Sede: Viale dell'Ateneo Lucano, Potenza, 85100
Materia tutor: Fisica C.I.
Numero ore: 80
Periodo di attività: dal 26 Marzo 2021 al 27 Settembre 2021
Atto di conferimento come da selezione pubblica emessa con P.d.D. Rep. N. 13-2021 del 01.02.2021 della Scuola di Ingegneria (SI) dell'Università degli Studi della Basilicata.

Nr 19
Titolo del corso: Corsi di studio del Dipartimento di Scienze (DIS) dell'Università degli Studi della Basilicata
Ente: Università degli Studi della Basilicata
Sede: Viale dell'Ateneo Lucano, Potenza, 85100
Materia tutor: Fisica C.I.

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Numero ore: 20
Periodo di attività: dal 25 Novembre 2019 al 31 Dicembre 2019
Atto di conferimento come da provvedimento n.538 del 22 Novembre 2019, protocollo n. 2916/111/2 del Dipartimento di Scienze (DIS) dell'Università degli Studi della Basilicata

Premi e/o Riconoscimenti nazionali ed internazionali assegnati da Istituzioni scientifiche di particolare rilevanza e prestigio

Nr 20
Descrizione del titolo: Autore della tesi di laurea che ha vinto il premio GRS29-CNI 2019 per le tre migliori tesi di laurea magistrale in Geoscienze e Telerilevamento.
<ul style="list-style-type: none"> - Assegnato da: The Institute of Electrical and Electronics Engineers (IEEE Geoscience and Remote Sensing Society (GRSS), Chapter Center-North Italy. - Data o anno di assegnazione: consegna premio 11 Febbraio 2020 e comunicazione vincita nel mese di Novembre 2019. - Altre informazioni: Vincitore del premio per la discussione della tesi di laurea magistrale dal titolo "Sviluppo di algoritmi InSAR per lo studio di deformazioni della superficie terrestre di grandi dimensioni: la tecnica Multiple Aperture Interferometry (MAI)" presso l'Università degli Studi di Basilicata in data 27 Febbraio 2019.

Nr 21
Descrizione del titolo: Best Poster Award (autore del lavoro), ESA/MOST Dragon IV meeting, Lubiana, Giugno 2019.
<ul style="list-style-type: none"> - Assegnato da: European Space Agency (ESA), Chinese Ministry of Science and Technology (MOST), National Remote Sensing Centre of China (NRSCC) - Data o anno di assegnazione: 28 Giugno 2019. - Altre informazioni: "Exploitation of a Multi-Grid Differential SAR Interferometry (DInSAR) Approach for the Investigation of Large-Scale Earth's Surface Deformation: Experiments on the Pearl River Delta (PRD) Region".

Presentazioni orali tenute a congressi internazionali

Nr 22
Descrizione del titolo: Presentazioni orali di contributi a congressi internazionali
<ul style="list-style-type: none"> - International Radiation Symposium (IRS): <ol style="list-style-type: none"> 1. Mastro P., Cimini D., Romano F., Ricciardelli F., Di Paola F., Hultberg T., August T., Serio C., Masiello G., "On the estimation of key Cloud Parameters from Satellite: an Artificial Intelligence-based retrieval framework", proceedings of International Radiation Symposium, 4 – 8 July, 2022, Thessaloniki, Greece. Data presentazione: 6 Luglio 2022 Attività svolta: presentazione di un framework di regressione statistica basato sull'intelligenza artificiale (AI) per la predizione dei parametri microfisici delle nubi da misure acquisite nelle bande dell'infrarosso e delle microonde da parte di sensori satellitari di tipo passivo. - Living Planet Symposium (LPS): <ol style="list-style-type: none"> 1. Mastro P., Masiello G., Cimini D., Romano F., Ricciardelli F., Di Paola F., Hultberg T., August T., Serio C., "IASI-NG estimation of effective radius for ice and liquid water clouds: a regression approach based on Random Forests", proceedings of Living Planet Symposium, 23 – 27 May, 2022, Bonn, Germany. Data presentazione: 27 Maggio 2022 Attività svolta: presentazione orale di un poster di un modello statistico di inversione basato sulle Random Forest (RF) per la regressione dei raggi effettivi di caduta delle nubi di acqua e ghiaccio mediante l'utilizzo di osservazioni dell'atmosfera terrestre acquisite dal sensore "Infrared Atmospheric Sounding Interferometer New Generation" (IASI-NG). 2. Mastro P., Calò F., Giordan D., Notti D., Pepe A., "On Monitoring the Impact of Floods and Extreme Weather Events in Protected Cultural Heritage Areas: The Venice Lagoon Case Study", proceedings of Living Planet Symposium, 23 – 27 May, 2022, Bonn, Germany. Data presentazione: 26 Maggio 2022 Attività svolta: presentazione orale di un poster in cui ho mostrato lo studio e l'analisi di fenomeni di subsidenza che si verificano nella Laguna di Venezia. In tale contesto, sono stati valutati anche i rischi legati a eventi alluvionali estremi che potrebbero caratterizzare la città di Venezia nel prossimo futuro. - International Electronic Conference on Remote Sensing (ECRS): <ol style="list-style-type: none"> 1. Mastro P., Pepe A., "Effective InSAR algorithms for the study of large Earth's surface deformations.", proceedings of

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the 4th International Electronic Conference on Remote Sensing (ECRS) 2022, 24-27 January 2022, Virtual Symposium.

Data presentazione: 26 Gennaio 2022

Attività svolta: presentazione orale a invito in cui ho mostrato lo studio e l'analisi di fenomeni di grandi deformazioni della superficie terrestre mediante l'utilizzo della tecnica "Multiple Aperture Interferometry" (MAI).

- **IASI Conference:**

1. **Mastro P.**, Masiello G., Cimini D., Romano F., Hultberg T., August T., Serio C., "IASI-NG estimation of effective radius for ice and liquid water clouds: a regression approach based on Random Forests", proceeding of IASI conference 6-10 December 2021, Evian, France.

Data presentazione: 10 Dicembre 2021

Attività svolta: presentazione orale di un modello di regressione statistica che stima il raggio effettivo di caduta delle nubi di ghiaccio e di acqua liquida da misure spettrali dell'atmosfera terrestre acquisite nella banda dell'infrarosso termico.

- **SPIE Conference:**

1. **Mastro P.**, Masiello G., Cimini D., Romano F., Ricciardelli E., Di Paola F., Hultberg T., August T., Serio C., "On the cloud liquid and ice water content regression: an inversion approach based on neural networks", proceedings of SPIE Remote Sensing Digital Forum, 13 – 17 Sept., 2021, Virtual Symposium.

Data presentazione: 12 Settembre 2021

Attività svolta: presentazione orale di un modello di regressione statistica basato sulle reti neurali per la stima dei contenuti di nubi di acqua liquida e ghiacciata da misure iperspettrali acquisite nelle bande dell'infrarosso termico e delle microonde.

2. **Mastro P.**, Pasquariello P., Masiello G., Serio C., "Cloud detection from IASI hyperspectral data: a statistical approach based on neural networks", proceedings of SPIE Remote Sensing Digital Forum, 21 – 25 Sept., 2020, Virtual Symposium.

Data presentazione: 20 Settembre 2020

Attività svolta: presentazione orale di uno studio sulla capacità di uno stimatore statistico basato sull'intelligenza artificiale (AI) per l'identificazione di nubi da misure spettrali dell'atmosfera terrestre acquisite nella banda dell'infrarosso termico da parte del sensore IASI.

- **ESA-MOST Dragon 4 Symposium:**

1. **Mastro P.**, Falabella F., Zhao Q., Serio C., Pepe A., "Exploitation of a Multi-Grid Differential SAR Interferometry (DInSAR) Approach for the Investigation of Large-Scale Earth's Surface Deformation: Experiments on the Pearl River Delta (PRD) Region," proceedings of ESA-MOST Dragon 4 Symposium, 24-28 June, 2019 Ljubljana, Slovenia.

Data presentazione: 26 Giugno 2019

Attività svolta: presentazione orale di un poster che investiga l'utilizzo di un metodo di decomposizione multigriglia di sequenze di interferogrammi SAR differenziali per l'identificazione di aree a maggiore deformazione della superficie terrestre.

- **European Conference on Synthetic Aperture Radar (EUSAR):**

1. **Mastro P.**, Pepe A. (2017), "Adaptive Spatial Multi-looking of Differential SAR Interferograms Sequences using Circular Statistic." proceedings of 12th European Conference on Synthetic Aperture Radar (EUSAR 2018), pp. 1 – 6, June 4 - 7, 2018, Aachen, Germany, ISBN: 978-3-8007-4636-1.

Data presentazione: 6 Giugno 2018

Attività svolta: presentazione orale che mostra le potenzialità di una metodologia basata sulla statistica direzionale volta al filtraggio del rumore interferometrico di sequenze di interferogrammi SAR differenziali.

- **IEEE International Geoscience and Remote Sensing Symposium (IGARSS):**

1. **Mastro P.**, Pepe A., "The Triplet Network Enhanced Spectral Diversity (T-NESD) Method for the Correction of TOPS

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Data Co-registration Errors for Non-Stationary Scenes”, proceedings of IEEE International Geoscience and Remote Sensing Symposium (IGARSS), July. 12 – 16, 2021 Brussels, Belgium, Virtual Symposium.

Data presentazione: 13 Luglio 2021

Attività svolta: presentazione orale di una metodologia innovativa volta alla correzione di errori di registrazione di osservazioni SAR Sentinel-1 acquisiti in modalità “Terrain Observation with Progressive Scan” (TOPS).

2. **Mastro P.**, Falabella F. Pepe A., “An Adaptive Statistical Multi-grid DInSAR Technique for Studying Multi-scale Earth Surface Deformation Phenomena”, proceedings of IEEE International Geoscience and Remote Sensing Symposium (IGARSS), Sept. 26 – Oct. 2, 2020 Hawaii, USA, Virtual Symposium.

Data presentazione: 28 Settembre 2020

Attività svolta: presentazione orale di un poster che investiga l'utilizzo di un metodo di decomposizione multigriglia di sequenze di interferogrammi SAR differenziali per l'identificazione di aree a maggiore deformazione della superficie terrestre.

Partecipazione a Commissioni, Commissioni di valutazione (referaggio)

Nr 23
Descrizione del titolo: Referaggio Articoli Scientifici presentati al congresso internazionale IGARSS, organizzato annualmente dalla IEEE Society.
Descrizione: Attività di referaggio.
Finalità: Attività di referaggio.
Ruolo svolto: Referee
Attività svolta: Attività di referaggio di articoli sottomessi ai seguenti congressi internazionali
2022 IEEE International Geoscience and Remote Sensing Symposium, J17–22 July, 2022, Kuala Lumpur, Malaysia
Periodo di attività: 2022
Obiettivi raggiunti: Revisioni effettuate.
Altre informazioni. n/a

Nr 24
Descrizione del titolo: Referaggio Articoli Scientifici
Descrizione: Attività di referaggio dei principali articoli sottomessi su riviste ISI peer-reviewed del settore del telerilevamento e dell'osservazione della Terra.
Finalità: Attività di referaggio di articoli sottomessi su riviste ISI peer-reviewed
Ruolo svolto: Referee
Attività svolta: Attività di referaggio di articoli sottomessi su riviste ISI peer-reviewed
Riviste: IEEE Transaction on Geoscience and Remote Sensing (TGRS) - TGRS-2021-03536, -TGRS-2021-01224 (2 manoscritti). IEEE Geoscience and Remote Sensing Letters (GRSL) - GRSL-00652-2021, - GRSL-00584-2020 (2 manoscritti) Journal of South American Earth Sciences - SAMES-D-20-00380R1 (1 manoscritto) Atmospheric Measurement Techniques (AMT) - amt-2022-184 (1 manoscritto)
Periodo di attività: dal 2020 ad oggi

Chairman e/o session manager di conferenze nazionali e internazionali

Nr 25
Conferenza: IEEE IGARSS 2021.
Luogo: Bruxelles, Belgio
Ruolo svolto: Session Manager
Altre informazioni: <ul style="list-style-type: none"> • Sessione WE1.O-4, Advanced Target Detection Method in Hyperspectral/Lidar/Radar • Sessione WE2.MM-4, Multi-applications of Image Segmentation I • Sessione WE3.O-4, Global Precipitation Mission with Emphasis on Hazard Mitigation • Sessione WE4.O-4, Research Challenges and Recent Advances for Tropical Forest Monitoring
Periodo di attività dal 12 al 16 Luglio 2021

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Indicatori bibliometrici



Fonte: **Google Scholar**
Data di riferimento: 15 Agosto 2022

Articoli

Nr 26
Descrizione del titolo: Articolo in rivista
Elenco autori: Pietro Mastro , Guido Masiello, Carmine Serio e Antonio Pepe
Titolo: Change Detection Techniques with Synthetic Aperture Radar Images: Experiments with Random Forests and Sentinel-1 Observations
Rivista: Remote Sensing, MDPI
Codice identificativo (ISSN): 2072-4292
DOI: https://doi.org/10.3390/rs14143323
Anno pubblicazione: 2022
Impact Factor rivista: 5.349
ruolo svolto: primo autore
numero citazioni: 1 (fonte: Google scholar)
Accesso: libero
<p>Abstract: This work aims to clarify the potential of incoherent and coherent change detection (CD) approaches for detecting and monitoring ground surface changes using sequences of synthetic aperture radar (SAR) images. Nowadays, the growing availability of remotely sensed data collected by the twin Sentinel-1A/B sensors of the European (EU) Copernicus constellation allows fast mapping of damage after a disastrous event using radar data. In this research, we address the role of SAR (amplitude) backscattered signal variations for CD analyses when a natural (e.g., a fire, a flash flood, etc.) or a human-induced (disastrous) event occurs. Then, we consider the additional pieces of information that can be recovered by comparing interferometric coherence maps related to couples of SAR images collected between a principal disastrous event date. This work is mainly concerned with investigating the capability of different coherent/incoherent change detection indices (CDIs) and their mutual interactions for the rapid mapping of "changed" areas. In this context, artificial intelligence (AI) algorithms have been demonstrated to be beneficial for handling the different information coming from coherent/incoherent CDIs in a unique corpus. Specifically, we used CDIs that synthetically describe ground surface changes associated with a disaster event (i.e., the pre-, cross-, and post-disaster phases), based on the generation of sigma nought and InSAR coherence maps. Then, we trained a random forest (RF) to produce CD maps and study the impact on the final binary decision (changed/unchanged) of the different layers representing the available synthetic CDIs. The proposed strategy was effective for quickly assessing damage using SAR data and can be applied in several contexts. Experiments were conducted to monitor wildfire's effects in the 2021 summer season in Italy, considering two case studies in Sardinia and Sicily. Another experiment was also carried out on the coastal city of Houston, Texas, the US, which was affected by a large flood in 2017; thus, demonstrating the validity of the proposed integrated method for fast mapping of flooded zones using SAR data.</p>
Nr 27
Descrizione del titolo: Articolo in rivista
Elenco autori: Pietro Mastro , Guido Masiello, Carmine Serio, Domenico Cimini, Elisabetta Ricciardelli, Francesco Di Paola, Tim Hultberg, Thomas August, Filomena Romano
Titolo: Combined IASI-NG and MWS Observations for the Retrieval of Cloud Liquid and Ice Water Path: A Deep Learning Artificial Intelligence Approach
Rivista: IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing
Codice identificativo (ISSN): 1939-1404
DOI: https://doi.org/10.1109/JSTARS.2022.3166992

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anno pubblicazione: 2022
Impact Factor rivista: 4.715
ruolo svolto: primo autore
numero citazioni: 1 (fonte: Google scholar)
Accesso: libero
Abstract: A neural network (NN) approach is proposed to combine future infrared (IASI-NG) and microwave (MWS) observations to retrieve cloud liquid and ice water path. The methodology is applied to simulated IASI-NG and MWS observations in the period January–October 2019. IASI-NG and MWS observations are simulated globally at synoptic hours (00:00, 06:00, 12:00, 18:00 UTC) and on a regular spatial grid ($0.125^\circ \times 0.125^\circ$) from ECMWF 5-generation reanalysis (ERA5). The state-of-the-art σ -IASI and RTTOV radiative transfer codes are used to simulate IASI-NG and MWS observations, respectively, from the earth's state vector given by ERA5. A principal component analysis of the simulated IASI-NG observations is performed. Accordingly, a NN is developed to retrieve cloud liquid and ice water path from a combination of 24 MWS channels and 30 IASI-NG PCs. Validation indicates that this combination results in liquid and ice water path retrievals with overall accuracy of $1.85 \cdot 10^{-2}$ kg/m ² and $1.18 \cdot 10^{-2}$ kg/m ² , respectively, and 0.97 correlation with respect to reference values. The root-mean-square error (RMSE) for CLWP results in about 30% of the mean value ($5.91 \cdot 10^{-2}$ kg/m ²) and 22% of the variability (1-sigma). Similarly, the RMSE for CIWP results in about 41% of the mean value ($2.91 \cdot 10^{-2}$ kg/m ²) and 22% of the variability. Two more NN are developed, retrieving cloud liquid and ice water path from microwave observations only (24 MWS channels) and infrared observations only (30 IASI-NG PCs), demonstrating quantitatively the advantage of using the combination of infrared and microwave observations with respect to either one alone.

Nr 28
Descrizione del titolo: Articolo in rivista
Elenco autori: Qing Zhao, Jiayi Pan, Adam Devlin, Qing Xu, Maochuan Tang, Zhengjie Li, Virginia Zamparelli, Francesco, Falabella, Pietro Mastro , Antonio Pepe
Titolo: Integrated Analysis of the Combined Risk of Ground Subsidence, Sea Level Rise, and Natural Hazards in Coastal and Delta River Regions
Rivista: Remote Sensing, MDPI
Codice identificativo (ISSN): 2072-4292
DOI: https://doi.org/10.3390/rs13173431
anno pubblicazione: 2019
Impact Factor rivista: 5.349
ruolo svolto: co-autore alla pari
numero citazioni: 1 (fonte: Google scholar)
Accesso: libero
Abstract: Non-climate-related anthropogenic processes and frequently encountered natural hazards exacerbate the risk in coastal zones and megacities and amplify local vulnerability. Coastal risk is amplified by the combination of sea level rise (SLR) resulting from climate change, associated tidal evolution, and the local sinking of land resulting from anthropogenic and natural hazards. In this framework, the authors of this investigation have actively contributed to the joint European Space Agency (ESA) and the Chinese Ministry of Science and Technology (MOST) Dragon IV initiative through a project (ID. 32294) that was explicitly designed to address the issue of monitoring coastal and delta river regions through Earth Observation (EO) technologies. The project's primary goals were to provide a complete characterization of the changes in target scenes over time and provide estimates of future regional sea level changes to derive submerged coastal areas and wave fields. Suggestions are also provided for implementing coastal protection measures in order to adapt and mitigate the multifactor coastal vulnerability. In order to achieve these tasks, well-established remote sensing technologies based on the joint exploitation of multi-spectral information gathered at different spectral wavelengths, the exploitation of advanced Differential Interferometric Synthetic Aperture Radar (DInSAR) techniques for the retrieval of ground deformations, the realization of geophysical analyses, and the use of satellite altimeters and tide gauge data have effectively been employed. The achieved results, which mainly focus on selected sensitive regions including the city of Shanghai, the Pearl River Delta in China, and the coastal city of Saint Petersburg in Europe, provide essential assets for planning present and future scientific activities devoted to monitoring such fragile environments. These analyses are crucial for assessing the factors that will amplify the vulnerability of low-elevation coastal zones.

Nr 29
Descrizione del titolo: Articolo in rivista
Elenco autori: Pablo Euillades, Leonardo Euillades, Antonio Pepe, Pietro Mastro , Francesco Falabella, Pasquale Imperatore, Yixian Tang, Patricia Rosell
Titolo: Recent advancements in multi-temporal methods applied to new generation SAR systems and applications in South America
Rivista: Journal of South American Earth Sciences
Codice identificativo (ISSN): 0895-9811
anno pubblicazione: 2021
DOI: https://doi.org/10.1016/j.jsames.2021.103410
Impact Factor rivista: 2.453
ruolo svolto: co-autore alla pari
numero citazioni: 2 (fonte: Google scholar)
Accesso: libero
Abstract: Detection and continuous monitoring of Earth's ground surface changes, triggered by natural phenomena or induced by human activities, is nowadays possible using Earth Observation (EO) technologies. Indeed, the exploitation of remotely sensed

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data collected by constellations of new-generation satellite platforms, complemented with in-situ measurements and ground-based observation systems, represents a well-established practice to get valuable information on Earth's crust and subsurface dynamics. The effects of extreme natural or man-induced events (e.g., earthquakes, volcanic eruptions, flooding phenomena, sea-level rise, big fires, etc.) have severe societal and economic impacts. In particular, the technologies based on the use of Synthetic Aperture Radar (SAR) images reached significant improvements in the last decade due to the growing availability of vast amounts of data collected by multiple-satellite sensors operating at different frequency bands and with complementary viewing angles, polarization and acquisition modes. Accordingly, to process a large amount of SAR data in a timely fashion, up-to-date high-performance computing (HPC) methods and tools are required. This paper addresses the state-of-the-art of SAR technologies for the analysis of long sequences of multiple sets of SAR images and provides a perspective on the forthcoming improvements of these technologies. In particular, the emphasis is placed on novel interferometric SAR and change detection methods, giving an overview of how those processing techniques have been used for investigating sites located in South and Central America. Moreover, an overview of the new generation of SAR sensors' observational capability, especially in the field of ground deformation analysis for mitigating the risk associated with natural and human-induced hazards, is provided. COSMO-SkyMed, ALOS, Sentinel-1, and SAOCOM data are exploited to show how natural and human-induced terrain displacement phenomena can be detected and investigated in different portions (X-, L- and C-band) of the microwave spectrum using SAR technologies.

Nr 30

Descrizione del titolo: Articolo in rivista

Elenco autori: Baohang Wang, Qin Zhang, Antonio Pepe, **Pietro Mastro**, Chaoying Zhao, Zhong Lu, Wu Zhu, Chengsheng Yang, Jing Zhang

Titolo: Integrated Analysis of the Combined Risk of Ground Subsidence, Sea Level Rise, and Natural Hazards in Coastal and Delta River Regions

Rivista: Remote Sensing, MDPI

Codice identificativo (ISSN): 2072-4292

DOI: <https://doi.org/10.3390/rs13112144>

anno pubblicazione: 2021

Impact Factor rivista: 5.349

ruolo svolto: co-autore alla pari

numero citazioni: 1 (fonte: Google scholar)

Accesso: libero

Abstract: This work investigated the large-scale ground deformations threatening the Northern Urumqi district, China, which are connected to groundwater exploitation and the seasonal freeze–thaw cycles that characterize this frozen region. Ground deformations can be well captured by satellite data using a multi-temporal interferometric synthetic aperture radar (Mt-InSAR) approach. The accuracy of the achievable ground deformation products (e.g., mean displacement time series and related ground displacement time series) critically depends on the number and quality of the selected interferograms. This paper presents a straightforward interferogram selection algorithm that can be applied to identify an optimal network of small baseline (SB) interferograms. The selected SB interferograms are then used to produce ground deformation products using the well-known small baseline subset (SBAS) Mt-InSAR algorithm. The developed interferogram selection algorithm (ISA) permits the selection of the group of SB data pairs that minimize the relative error of the mean ground deformation velocity. Experiments were carried out using a group of 102 Sentinel-1B SAR data collected from 12 April 2017 to 29 October 2020. This research study shows that the investigated farmland region is characterized by a maximum ground deformation rate of about 120 mm/year. Periodic groundwater overexploitation, coupled with irrigation and freeze–thaw phases, is also responsible for seasonal (one-year) ground displacement signals, with oscillation amplitudes up to 120 mm in the zones of maximum displacement.

Nr 31

Descrizione del titolo: Articolo in rivista

Elenco autori: Antonio Pepe, **Pietro Mastro**, Cathleen E. Jones

Titolo: Adaptive Multilooking of Multitemporal Differential SAR Interferometric Data Stack Using Directional Statistics

Rivista: IEEE Transactions on Geoscience and Remote Sensing

Codice identificativo (ISSN): 0196-2892

anno pubblicazione: 2020

Impact Factor rivista: 8.125

ruolo svolto: co-autore alla pari

numero citazioni: 2 (fonte: Google scholar)

Accesso: limitato

Abstract: In this article, we present an innovative space–time adaptive multilooking technique that operates on a sequence of multitemporal, differential synthetic aperture radar interferograms. The developed approach relies on the application of the fundamentals of directional statistics theory. At variance with other methods that identify the set of statistically homogenous pixels (SHPs) within a multilooking (complex averaging) window based on the statistics of the single-look-complex (SLC) SAR images, the proposed method is exclusively based on the analysis of the multitemporal sequence of full resolution DInSAR interferograms. The SHPs are then used to generate spatially adaptive multilooked interferograms both at the native, full-scale grid of the SLC images and at the multilooked resolution scale. The algorithm is effective and simple to implement, only requiring the availability of a sequence of full-scale differential SAR interferometry (DInSAR) interferograms. The interferograms can then be used to generate ground displacement time-series through advanced multitemporal interferometric SAR (MTInSAR) approaches. Experimental results obtained by applying the adopted technique to two SAR data sets acquired at X- and L-band, respectively, demonstrate the validity of the developed method.

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Nr 32
Descrizione del titolo: Articolo in rivista
Elenco autori: Pietro Mastro , Carmine Serio, Guido Masiello, Antonio Pepe
Titolo: The Multiple Aperture SAR Interferometry (MAI) Technique for the Detection of Large Ground Displacement Dynamics: An Overview
Rivista: Remote Sensing, MDPI
Codice identificativo (ISSN): 2072-4292
DOI: https://doi.org/10.3390/rs12071189
anno pubblicazione: 2020
Impact Factor rivista: 5.349
ruolo svolto: primo autore
numero citazioni: 20 (fonte: Google scholar)
Accesso: libero
<p>Abstract: This work presents an overview of the multiple aperture synthetic aperture radar interferometric (MAI) technique, which is primarily used to measure the along-track components of the Earth's surface deformation, by investigating its capabilities and potential applications. Such a method is widely used to monitor the time evolution of ground surface changes in areas with large deformations (e.g., due to glaciers movements or seismic episodes), permitting one to discriminate the three-dimensional (up-down, east-west, north-south) components of the Earth's surface displacements. The MAI technique relies on the spectral diversity (SD) method, which consists of splitting the azimuth (range) Synthetic Aperture RADAR (SAR) signal spectrum into separate sub-bands to get an estimate of the surface displacement along the azimuth (sensor line-of-sight (LOS)) direction. Moreover, the SD techniques are also used to correct the atmospheric phase screen (APS) artefacts (e.g., the ionospheric and water vapor phase distortion effects) that corrupt surface displacement time-series obtained by currently available multi-temporal InSAR (MT-InSAR) tools. More recently, the SD methods have also been exploited for the fine co-registration of SAR data acquired with the Terrain Observation with Progressive Scans (TOPS) mode. This work is primarily devoted to illustrating the underlying rationale and effectiveness of the MAI and SD techniques as well as their applications. In addition, we present an innovative method to combine complementary information of the ground deformation collected from multi-orbit/multi-track satellite observations. In particular, the presented technique complements the recently developed Minimum Acceleration combination (MinA) method with MAI-driven azimuthal ground deformation measurements to obtain the time-series of the 3-D components of the deformation in areas affected by large deformation episodes. Experimental results encompass several case studies. The validity and relevance of the presented approaches are clearly demonstrated in the context of geospatial analyses.</p>

Nr 33
Descrizione del titolo: Articolo in rivista
Elenco autori: Carmine Serio, Guido Masiello, Pietro Mastro , David C. Tobin
Titolo: Characterization of the Observational Covariance Matrix of Hyper-Spectral Infrared Satellite Sensors Directly from Measured Earth Views
Rivista: Sensor, MDPI
Codice identificativo (ISSN): 1424-8220
DOI: https://doi.org/10.3390/s20051492
anno pubblicazione: 2020
Impact Factor rivista: 3.847
ruolo svolto: co-autore alla pari
numero citazioni: 4 (fonte: Google scholar)
Accesso: libero
<p>Abstract: The observational covariance matrix, whose diagonal square root is currently named radiometric noise, is one of the most important elements to characterize a given instrument. It determines the precision of measurements and their possible spectral inter-correlation. The characterization of this matrix is currently performed with blackbody targets of known temperature and is, therefore, an output of the calibration unit of the instrument system. We developed a methodology that can estimate the observational covariance matrix directly from calibrated Earth-scene observations. The technique can complement the usual analysis based on onboard blackbody calibration and is, therefore, a useful back up to check the overall quality of the calibration unit. The methodology was exemplified by application to three satellite Fourier transform spectrometers: IASI (Infrared Atmospheric Sounder Interferometer), CrIS (Cross-Track Infrared Sounder), and HIRAS (Hyperspectral Infrared Atmospheric Sounder). It was shown that these three instruments are working as expected based on the pre-flight and in-flight characterization of the radiometric noise. However, for all instruments, the analysis of the covariance matrix reveals extra correlation among channels, especially in the short wave spectral regions.</p>

Nr 34
Descrizione del titolo: Articolo in rivista
Elenco autori: Qing Zhao, Guanyu Ma, Qiang Wang, Tianliang Yang, Min Liu, Wei Gao, Francesco Falabella, Pietro Mastro , Antonio Pepe
Titolo: Generation of long-term InSAR ground displacement time-series through a novel multi-sensor data merging technique: The case study of the Shanghai coastal area.
Rivista: ISPRS Journal of Photogrammetry and Remote Sensing
Codice identificativo (ISSN): 0924-2716
DOI: https://doi.org/10.1016/j.isprsjprs.2019.05.005
anno pubblicazione: 2019

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Impact Factor rivista: 11.774
ruolo svolto: co-autore alla pari
numero citazioni: 41 (fonte: Google scholar)
Accesso: libero
Abstract: Ground deformation is one of the most significant challenges faced by many coastal mega-cities, with major societal and economic impacts. In this context, the possibility to monitor the temporal evolution of the ground subsidence processes, which may also last for several years, is of great relevance. This goal can be obtained by applying differential SAR interferometry (DInSAR) techniques to sequences of multiple-satellite synthetic aperture radar (SAR) images. Moreover, the growing availability of large archives of SAR images collected by different SAR instruments nowadays leads to the need of developing new data merging techniques, which may take profit from the complementary information recoverable from every single set of data. In this work, a novel data merging approach for the generation of long-term ground displacement time-series, based on the use of the modified Quantile-Quantile Adjustment (MQQA) algorithm, is proposed. Specifically, the methodology has successfully been applied to study the long-term evolution of the ground subsidence occurred in the coastal area of Shanghai from February 2007 to April 2017. A cross-comparison analysis between DInSAR and ground truth data has also been carried out, showing that the average root mean square error (RMSE) between the obtained displacement time-series and available ground truth data is of about 3 mm. This outcome confirms the validity of the novel DInSAR-based MQQA combination method.

Libri, capitoli di libri e atti di congresso

Nr 35
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Domenico Cimini, Filomena Romano, Elisabetta Ricciardelli, Francesco Di Paola, Guido Masiello, Carmine Serio
Titolo: On the Synergic Use of Satellite Microwave and Infrared Measurements for the Estimation of Effective Radius of Ice and Liquid Water Clouds: a regression approach based on Random Forests
Congresso internazionale SPIE 2021, Remote Sensing of Clouds and the Atmosphere XXVII, 3-7 Settembre 2022, Berlino. Germania
Codice identificativo (ISBN): 9781510621558
anno pubblicazione: 2022
ruolo svolto: primo autore (presentazione poster)
numero citazioni: 0
Accesso: limitato
Abstract: Observations from spaceborne microwave (MW) and infrared (IR) passive sensors are the backbone of current satellite meteorology, essential for data assimilation into modern numerical weather prediction and climate benchmarking. In this context, over the last decades, the study and the analysis of cloud microphysics have received increasing attention to better understand cloud feedbacks on climate. MW and IR observations from space offer complementary features concerning cloud microphysics, and various tools have been developed to retrieve cloud parameters such as the effective radius of water and ice clouds. However, MW-IR synergy for cloud investigation is currently under-explored. In this framework, innovative processing methods, such as those based on the use of Artificial Intelligence (AI), which can run on large databases and can handle hundreds of input variables from different sensors, such as those operating in hyperspectral and multispectral channels of the infrared and the microwave bands, such as the New Generation Atmospheric Sounding Interferometer (IASI-NG) and the Microwave Sounder (MWS) of the EPS second generation (EPS-SG) platforms whose forthcoming launch is scheduled from 2024 onwards. A regression framework has been implemented based on the combined use of Random Forest (RF) regression and the principal components analysis (PCA) of IASI-NG and MWS observations to input the RF regressors. The supervised learning of liquid and ice water clouds' effective radii was carried out based on this framework. In conclusion, the regression analysis shows good agreement between reference and retrieved effective radius, with 80% correlation and root-mean-square error (RMSE) of 0.68 μm for liquid and 11.6 μm for ice cloud effective radius.

Nr 36
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Guido Masiello, Pietro Mastro , Carmine Serio, Francesco Falabella, Pamela Pasquariello
Titolo: Methane profile retrieval from satellite: a deep learning inversion approach based on feed-forward neural networks
Congresso internazionale SPIE 2021, Remote Sensing of Clouds and the Atmosphere XXVII, 3-7 Settembre 2022, Berlino. Germania
Codice identificativo (ISBN): 9781510621558
anno pubblicazione: 2022
ruolo svolto: co-autore alla pari
numero citazioni: 0
Accesso: limitato
Abstract: In this work, a nonlinear statistical regressor method based on deep learning feed-forward neural network (NN) for the retrieval of atmospheric CH ₄ is proposed. The methodology has been trained and validated on a simulated dataset of observations by the processing of the Monitoring Atmospheric Composition and Climate (MACC) Reanalysis dataset with the state-of-the-art transfer model (RTM) σ -IASI-as. Global data related to one day of the 12 months of 2012 and four synoptic hours (00-06-12-18 UTC) have been processed to catch typical seasonal and diurnal cycles, corresponding to a fairly large number (168.000) of simulated IASI-L1 spectral radiances. CH ₄ profiles have been predicted on 60 pressure layers. A regression framework based on the principal components analysis (PCA) of the IASI radiances and CH ₄ profiles has been implemented. The choice of the number of principal components has been addressed by the study of their eigenvalues, to filter redundant

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information from IASI channels and extract the most significant information from the CH₄ profiles. The analysis of the NN retrieval, shows agreement with the reference MACC CH₄ contents, allowing to obtain unbiased profile estimates, with accuracy on the total content of about 1.55%. The same accuracy has been obtained for the tropospheric column while for the stratosphere atmospheric column the accuracy is about 3%. Finally, an additional analysis of the CH₄ total content shows a correlation between the reference and predicted values of about 0.97.

Nr 37
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Carmine Serio, Italia De Feis, Guido Masiello, Pietro Mastro , Pamela Pasquariello, Sara Venafrà
Titolo: Exploiting the IASI profiling capability for temperature and water vapour to design a new water deficit index to monitor drought and heatwaves
Congresso internazionale SPIE 2021, Remote Sensing of Clouds and the Atmosphere XXVII, 3-7 Settembre 2022, Berlino. Germania
Codice identificativo (ISBN): 9781510621558
anno pubblicazione: 2022
ruolo svolto: co-autore alla pari
numero citazioni: 0
Accesso: limitato
Abstract: Vegetation and soil water stress are significant widespread problems because of climate change in many countries. Drought is a natural disaster common in semiarid regions and the Mediterranean mid-latitudes. Long-lasting drought can increase forest fire risk in areas with rich vegetation and forested areas. In contrast, drought can lead to water stress in a semiarid region. Therefore, vegetation and soil water stress require actions to monitor and detect such stresses to mitigate their negative impacts on human life, wildlife and plant communities. Vegetation and soil moisture stress can be estimated using three different methods: (1) field measurements, (2) meteorological data, and (3) remote sensing. The present study is mainly focused on remote sensing from the satellite. The main objective is to develop and test new indices of vegetation-soil dryness based on the surface temperature complemented with atmospheric water vapour mixing ratio or related parameters, such as the dew point temperature. Towards this objective, we will exploit the IASI (Infrared Atmospheric Sounding Interferometer) instrument, which is flying on the MetOp satellites.

Nr 38
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Domenico Cimini, Filomena Romano, Elisabetta Ricciardelli, Francesco Di Paola, Tim Hultber, Thomas August, Carmine Serio, Guido Masiello
Titolo: On the estimation of key Cloud Parameters from Satellite: an Artificial Intelligence-based retrieval framework
Congresso internazionale International Radiation Symposium (IRS), Salonicco, Grecia, 4-8 Luglio 2022
Codice identificativo (ISBN): 1551-7616
anno pubblicazione: 2022
ruolo svolto: primo autore (presentazione orale)
numero citazioni: 0
Accesso: limitato
Abstract: Over the last 3 decades, the study and the analysis of cloud microphysics have received increasing attention to better understand cloud feedbacks on climate. Today, satellite remote sensing is the leading approach to infer cloud properties (Fritz & Winston, 1962). Using instruments operating in the visible, infrared, and microwave bands, a variety of tools have been developed to retrieve cloud microphysics properties (Dowell et al., 2013; Lin et al., 1998; Wilhelm & Hutchison, 2000). Here, the addressed key cloud parameters are the vertical profiles of cloud liquid water content (CLWC) and cloud ice water content (CIWC), their column-integrated values, cloud liquid water path (CLWP) and cloud ice water path (CIWP), and finally the cloud drop effective radius (re). These are essential cloud microphysics parameters to investigate the way clouds affect the hydrological cycle and radiative components of the climate system. However, the physical characterization of the cloud is still challenging. One way to overcome some of the observing limitations is sensor synergy, i.e. combining the complementary advantages offered by different parts of the spectrum (e.g., infrared and microwave bands) (Lin et al., 1998). As Earth observation programs develop, improvements in spatial and spectral resolutions of satellite-borne sensors promote more sophisticated retrieval procedures, such as those based on the use of Artificial Intelligence (AI) that will help to estimate cloud products with enhanced accuracy. This presentation builds on the analyses made within the EUMETSAT ComboCloud project (contract EUM/CO/19/4600002352/THH) whose purpose was to develop AI-based solutions to infer key cloud parameters exploiting the combination of innovative features offered by upcoming satellite sensors, namely the Next Generation Atmospheric Sounding Interferometer (IASI-NG), and the Microwave Sounder (MWS). We present the potential of the developed solutions applied to real observations, from the instruments flying onboard the EUMETSAT MetOp satellites such as the Atmospheric Sounding Interferometer (IASI), the Advanced Microwave Sounding Unit (AMSU), and the Microwave Humidity Sounder (MHS) and validated against cloud products from independent CloudSat/Calipso sensor and ECMWF analysis. The validation demonstrated good agreement between reference and retrieved cloud key parameters, showing consistent range and spatial patterns. In most cases, the obtained accuracy for the retrieved cloud parameters is within the "goal" and "breakthrough" values set by the WMO OSCAR requirements for global numerical weather prediction (https://www.wmo-sat.info/oscar/requirements).

Nr 39
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Guido Masiello, Carmine Serio, Sara Venafrà, Pietro Mastro , Tiziano Maestri, Davide Magurno, William Cossich, Michele Martinazzo

22/08/2022

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Titolo: The extended All-Sky σ -IASI Forward Model for the Next Generation IASI-NG and FORUM Infrared Atmospheric Sounders: Towards the Analysis and Retrieval of Cloud Microphysical Properties
Congresso internazionale Living Planet Symposium (LPS), Bonn, Germania, 23-27 Maggio 2022
anno pubblicazione: 2022
ruolo svolto: co-autore alla pari
numero citazioni: 0
Accesso: limitato
<p>Abstract: Developed in the framework of several projects to support IASI mission, σ-IASI is a forward model designed for the fast calculation of radiance and its derivatives with respect to atmospheric and spectroscopic parameters of nadir-looking hyperspectral instruments. The σ-IASI module is a monochromatic radiative transfer model based on a look-up table of optical depths parametrized as a polynomial concerning the atmospheric temperature and constituents. The look-up table is built based on the current LBLRTM (Line-By-Line Radiative Transfer Model) version, but the model can use other line-by-line models and different spectroscopic parameters. The strategy enables fast, accurate radiance and analytical derivatives calculations preserving the model flexibility that can be applied straightforwardly to all the hyperspectral instruments in Thermal Infrared. Thanks to the flexibility with respect to the instrument peculiarities and with respect to the spectroscopic parameters, the forward model was applied successfully both for retrieval of atmospheric and surface parameters applications and spectroscopy validation to IASI measurements and other interferometers and radiometers such as AIRS (the NASA Atmospheric InfraRed Sounder), NAST-I (the NPOESS Aircraft Sounding Testbed- Interferometer), and IMG (the Japanese Interferometer Monitoring Greenhouse Gases), REFIR (Radiation Explorer in the Far Infrared). In this work, we present the extension of the forward model to the far-infrared. With this extension, the spectral coverage goes from 5 to 3000 cm^{-1} and, therefore, is suited for IASI-NG and the FORUM (Far-infrared Outgoing Radiation Understanding and Monitoring) instrument onboard the 9th ESA explorer mission. FORUM is expected to cover the range 100 to 1600 cm^{-1}, that is, the far-infrared spectral region of the Earth emission spectrum, which is of paramount interest for water vapour and cirrus cloud processes affecting climate and global warming.</p> <p>The present version of the model considers ice and water clouds and aerosols by representing their multiple scattering and absorption properties with an improved, analytical parameterization of the so-called Chou approximation. Thanks to this original parameterization, the new version of σ-IASI is the only fast-forward model capable of computing analytical Jacobian derivatives with respect to ice and water content concentrations and respect to the effective radius. Thus, the new σ-IASI model yields for the retrieval of cloud microphysical properties.</p>

Nr 40
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Guido Masiello, Domenico Cimini, Filomena Romano, Elisabetta Ricciardelli, Francesco Di Paola, Tim Hultberg, Thomas August, Carmine Serio
Titolo: IASI-NG estimation of effective radius for ice and liquid water clouds: a regression approach based on Random Forests
Congresso internazionale Living Planet Symposium (LPS), Bonn, Germania, 23-27 Maggio 2022
anno pubblicazione: 2022
ruolo svolto: primo autore (presentazione poster)
numero citazioni: 0
Accesso: limitato
<p>Abstract: Over the last 3 decades, the study and the analysis of cloud microphysics have received increasing attention to better understand cloud feedbacks on climate. Today, satellite remote sensing is the leading approach to infer cloud properties. Using optical instruments, operating in the visible and infrared bands, a variety of tools have been developed, to retrieve cloud microphysics properties such as the effective radius of water and ice clouds. The forthcoming launch of new advanced high spectral resolution satellite sensors, such as the Next Generation Atmospheric Sounding Interferometer (IASI-NG), promises to provide more accurate estimates of cloud microphysical parameters. Because of the high dimensionality of the data space, innovative processing methods are needed, such as those based on the use of Artificial Intelligence (AI) and related tools, which can run on large databases and can handle hundreds of input variables without variable deletion. In this work, we present an assessment of the performance of a statistical regression scheme for the effective radius of liquid and ice water clouds. The tool has been implemented through the use of a random forest (RF) regressor. RFs have been applied in many research areas, including those related to remote sensing of clouds, e.g. cloud detection and classification, because of their ability to use all potentially predictive features. The methodology has been trained and validated with a set of simulated IASI-NG L1C observations, covering the global scale. ERA5-ECMWF atmospheric and surface variables are used as "state vector", from which simulated IASI-NG observations are obtained with the state of art σ-IASI forward model. A regression framework based on the principal components analysis (PCA) of IASI-NG radiances to input the RF regressors has been implemented. The choice of the optimal number and order of the input principal components or scores has been performed by exploiting the RF methodology, which operates by constructing a multitude of decision trees at training time and outputting what variables are most important in the regression. Using this framework, the supervised learning of liquid and ice water clouds' effective radii was carried out. As a conclusion, the regression analysis shows good agreement between reference and retrieved effective radius, with 80% correlation and root-mean-square error (RMSE) of 0.78 for liquid and 1.15 for ice cloud effective radius.</p>

Nr 41
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Fabiana Calò, Daniele Giordan, Davide Notti, Antonio Pepe
Titolo: On Monitoring the Impact of Floods and Extreme Weather Events in Protected Cultural Heritage Areas: The Venice Lagoon Case Study
Congresso internazionale Living Planet Symposium (LPS), Bonn, Germania, 23-27 Maggio 2022
anno pubblicazione: 2022

22/08/2022

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ruolo svolto: primo autore (presentazione poster)
numero citazioni: 0
Accesso: limitato
<p>Abstract: Coastal flood risk and adaptation are worldwide concerns About 40 million people are currently living in coastal port cities are likely to be subject to one big coastal flood event each century. The most significant inundation mainly occurs in the delta regions of Asia and Europe, including China, the Netherlands, Vietnam, and Egypt, all of which have relatively sensitive flood exposure. Besides, European coasts will also be strongly impacted by climate-induced flood risk in the coming century. Satellite remote sensing is a valuable tool for detecting and monitoring flood phenomena, allowing the differentiation between inundated and non-inundated areas. Flood risk increases due to urban growth, ground subsidence and climate change. Identifying areas more prone to extreme floods is useful for optimizing urban planners' civil protection actions and evaluating damage. In recent years, new advances in RS technology have allowed the generation of rapid damage prediction maps and associated models helpful in the occurrence of a flood event [e.g., using the Copernicus Emergency Management Service (https://emergency.copernicus.eu/)].</p> <p>In this work, we address the impacts of floods and extreme weather events on coastal areas cultural heritage preservation by focusing on the case of the monumental city of Venice and the whole Venice Lagoon area. The Venice Lagoon represents the largest lagoonal system in Italy, one of the largest in the Mediterranean Sea, and one of the most important industrial areas of Italy. The lagoonal system comprises the city of Venice, which represents an extraordinary archaeological, urban, architectural, artistic, and cultural heritage masterpiece. The Venice Lagoon ecosystem is characterized by different drivers of change (land-based feeding activities, heavy metal extraction, ground-water extraction, etc), causing multiple environmental impacts of the Lagune[8]; the subsidence phenomenon of the terrain is one of the most important.</p> <p>Flooding events have always characterized the Venice Lagoon area, mainly result from a combination of tide, seiches, and easterly winds. In the last decades, due to the climate change phenomenon that continuously estate the rise in sea level, flooding events of the Venice Lagoon became more frequent. In such a context, new techniques that allow to timely monitor the ground deformations of the area are needed.</p> <p>In this work, we analyze the ground deformation (subsidence) occurred in Venice Lagoon in the recent years using the multi-temporal interferometric Small Baseline Subset (SBAS) technique. We also study the interlinked effects among the background subsidence of the area and the recent extreme flood events that occurred on November 2019 by analyzing the time-series of the S-1 backscattered signals, identifying the extent of flooded regions and the impact of floods on the built CH. Specifically, coherent and incoherent change detection methods have been applied to study these phenomena. The analyses have been carried out considering a set of 120 Sentinel1-A images, acquired in the period from January 2017 to December 2021. This study aims to make a comprehensive analysis of the subsidence deformations that occurs in the Venice Lagoon to evaluate the risks related to extreme flood events that could characterize the area in the near future. We also provide some basic models describing the long-term risk of flooding in the entire Lagoon region and potentially extending the investigation to the river delta system of the Po River.</p>

Nr 42
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro
Titolo: Effective InSAR algorithms for the study of large Earth's surface deformations
Congresso internazionale 4th International Electronic Conference on Remote Sensing (ECRS), 24-27 Gennaio 2022, virtuale.
anno pubblicazione: 2022
ruolo svolto: primo autore (presentazione orale a invito)
numero citazioni: 0
Accesso: limitato
<p>Abstract: The exploitation of Earth observation (EO) methods, based on the use of instruments operating in the microwave region of the electromagnetic spectrum, represents a common practice nowadays in the scientific community. In this context, the development of new remote sensing techniques and the consolidation of well-established ones is fostered by increasing amounts of EO data collected by several sensors (on-board space or aerial vectors) that have emerged in recent years. A significant role is performed by the technologies based on their use of synthetic aperture radar (SAR) data that allow long-lasting and extensive monitoring of the Earth's surface. In this framework, several techniques have been developed to process and analyze SAR data. Among these, in recent decades, SAR interferometry techniques (InSAR) have gained a role of particular relevance in the study of the Earth's surface displacement phenomena. This work presents an overview of the multiple aperture synthetic aperture radar interferometric (MAI) technique, which is primarily used to measure the along-track components of the Earth's surface deformation, by investigating its capabilities and potential applications. Such a method is widely used to monitor the time evolution of ground surface changes in areas with large deformations (e.g., due to glaciers movements or seismic episodes), permitting one to discriminate the three-dimensional (up-down, east-west, north-south) components of the Earth's surface displacements. The MAI technique relies on the spectral diversity (SD) method, which consists of splitting the azimuth (range) Synthetic Aperture RADAR (SAR) signal spectrum into separate sub-bands to get an estimate of the surface displacement along the azimuth (sensor line-of-sight (LOS)) direction. Finally, the underlying rationale and effectiveness of the MAI and SD techniques, as well as their application will be presented next to an innovative method to combine complementary information of the ground deformation collected from multi-orbit/multi-track satellite observations.</p>

Nr 43
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Guido Masiello, Domenico Cimini, Filomena Romano, Tim Hultberg, Thomas August, Carmine Serio
Titolo: IASI-NG estimation of effective radius for ice and liquid water clouds: a regression approach based on Random Forests

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Congresso internazionale IASI 2021, Evian, Francia, 6-10 Dicembre 2021
anno pubblicazione: 2021
ruolo svolto: primo autore (presentazione orale)
numero citazioni: 0
Accesso: limitato
<p>Abstract: Over the last 3 decades, the study and the analysis of cloud microphysics have received increasing attention to better understand cloud feedbacks on climate. Today, satellite remote sensing is the leading approach to infer cloud properties. Using optical instruments, operating in the visible and infrared bands, a variety of tools have been developed, to retrieve cloud microphysics properties such as the effective radius of water and ice clouds.</p> <p>The forthcoming launch of new advanced high spectral resolution satellite sensors, such as the Next Generation Atmospheric Sounding Interferometer (IASI-NG), promises to provide more accurate estimates of cloud microphysical parameters. Because of the high dimensionality of the data space, innovative processing methods are needed, such as those based on the use of Artificial Intelligence (AI) and related tools, which can run on large databases and can handle hundreds of input variables without variable deletion. In this work, we present an assessment of the performance of a statistical regression scheme for the effective radius of liquid and ice water clouds. The tool has been implemented through the use of a random forest (RF) regressor. RFs have been applied in many research areas, including those related to remote sensing of clouds, e.g. cloud detection and classification, because of their ability to use all potentially predictive features. The methodology has been trained and validated with a set of simulated IASI-NG L1C observations, covering the global scale. ERA5-ECMWF atmospheric and surface variables are used as "state vector", from which simulated IASI-NG observations are obtained with the state of art σ-IASI forward model. A regression framework based on the principal components analysis (PCA) of IASI-NG radiances to input the RF regressors has been implemented. The choice of the optimal number and order of the input principal components or scores has been performed by exploiting the RF methodology, which operates by constructing a multitude of decision trees at training time and outputting what variables are most important in the regression. Using this framework, the supervised learning of liquid and ice water clouds' effective radii was carried out. As a conclusion, the regression analysis shows good agreement between reference and retrieved effective radius, with 80% correlation and root-mean-square error (RMSE) of 0.78 for liquid and 1.15 for ice cloud effective radius.</p>

Nr 44
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Guido Masiello, Domenico Cimini, Filomena Romano, Elisabetta Ricciardelli, Francesco Di Paola, Tim Hultberg, Thomas August, Carmine Serio
Titolo: Cloud liquid and ice water content estimation from satellite: a regression approach based on neural networks
Congresso internazionale SPIE 2021, Remote Sensing of Clouds and the Atmosphere XXVI, 13-17 Settembre 2021, virtuale.
Codice identificativo (ISBN): 9781510621558
DOI: https://doi.org/10.1117/12.2600124
anno pubblicazione: 2021
ruolo svolto: primo autore (presentazione orale)
numero citazioni: 0
Accesso: limitato
<p>Abstract: Cloud microphysics in terms of their liquid/ice water content and particle size are the principal factors addressed to study and understand the behavior behind the climate change phenomenon. Based on remotely sensed measurements, in the last decades, some evidence exists that an increase in temperature leads to an increase in cloud liquid water content (CLWC). The temperature dependence of ice water content (CIWC) is also evident from measurements of midlatitude cirrus clouds. Hence, innovative methods, such as those based on the use of Artificial Intelligence (AI) allowing a more relevant investigation of how clouds influence the hydrological cycle and radiative components of the Earth's climate system, are required. This work investigates the capability of a statistical regression scheme of CLWC and CIWC, implemented through the use of a multilayer feed-forward neural network (NN). The whole methodology is applied to a set of simulated IASI-NG L1C and MWS acquisitions, covering the global scale. The NN regression analysis shows good agreement with the test data. The retrieved cloud liquid water and ice profiles have an accuracy of 20 to 60% depending on the given layer. Finally, the layer with the maximum concentration is accurately identified.</p>

Nr 45
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Carmine Serio, Guido Masiello, Pietro Mastro , Sauveur Belviso, Marine Remaud
Titolo: Seasonal variability of degrees of freedom and its effect over time series and spatial patterns of atmospheric gases from satellite: application to carbonyl sulfide (OCS)
Congresso internazionale SPIE 2021, Remote Sensing of Clouds and the Atmosphere XXVI, 13-17 Settembre 2021, virtuale.
Codice identificativo (ISBN): 9781510621558
DOI: https://doi.org/10.1117/12.2599761
anno pubblicazione: 2021
ruolo svolto: co-autore alla pari
numero citazioni: 0
Accesso: limitato
<p>Abstract: Degrees of freedom or d.o.f. of satellite-based retrievals characterize their independence from the constraints assumed in the inversion process. In the context of Optimal Estimation (OE), the condition is expressed in terms of the background state, which, in a Bayesian meaning, is our best prior knowledge about the parameters we want to estimate. In effect, even if the background is static, it could add artifacts to the retrievals, which modify the seasonal cycle or the spatial patterns of 2-D fields. The issue has been addressed with an analytical treatment based on the OE theory. We derive formulas, which allow us to assess</p>

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the modulation introduced by d.o.f. variability. The methodology will be exemplified with the help of observations from the Infrared Atmospheric Sounder Interferometer (IASI) onboard the European MetOp satellites. Both time series and 2-D fields of observations will be considered. The analysis is extended to tropical and Mid-Lat regions to exemplify the effect of seasonal variability of d.o.f. The analysis will focus mainly on OCS (carbonyl sulfide) variability in the atmosphere, a new clue to how much carbon plants take up, hence of primary interest to the carbon cycle and the climate. However, our methodology can be applied to any gas or retrieved parameter. For the OCS, we have found that d.o.f. variability is of no concern in the tropics. Still, it becomes crucial at Mid-latitudes where the seasonal cycle can add spurious variability to temporal and spatial patterns.

Nr 46
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Guido Masiello, Angela Cersosimo, Francesco Falabella, Pietro Mastro , Pamela Pasquariello, Carmine Serio, Sara Venafra
Titolo: Assessment of air quality with TROPOMI during COVID-19 pandemic: NO ₂ over the Po valley
Congresso internazionale SPIE 2021, Remote Sensing of Clouds and the Atmosphere XXVI, 13-17 Settembre 2021, virtuale.
Codice identificativo (ISBN): 9781510621558
DOI: https://doi.org/10.1117/12.2599774
anno pubblicazione: 2021
ruolo svolto: co-autore alla pari
numero citazioni: 0
Accesso: limitato
Abstract: An analysis of the air quality over the Po valley has been performed by using both satellite and in situ observations of NO ₂ for the COVID-19 years, 2019-2021. To match satellite observations to those in situ, we have used a geostatistical re-gridding technique. The tools allow us to scale the satellite NO ₂ retrievals to a finer spatial resolution, which helps us to perform a better spatial collocation with in situ observations. The satellite data consist of Level 2 (L2) NO ₂ retrievals from TROPOMI (the TROPOspheric Monitoring Instrument), whereas in situ observations are taken at eleven diverse stations, which are spread over the Po valley. The Po Valley, in the winter 2019/20, has been the first region in Europe to be severely hit by the COVID-19 pandemic. The Italian government introduced severe restriction measures from March to May 2020 (lockdown). We compared TROPOMI NO ₂ concentration during winters 2018-19 (no-COVID-19) and the following 2 winters. The observations of TROPOMI, in agreement with the in-situ measurements, saw a significant decrease in the NO ₂ concentration in March 2020 after the introduction of the lockdown. But they also found a general decrease in lower tropospheric NO ₂ in winter 2019/2020, the warmest winter ever observed that has limited the use of power for residential and commercial heating. NO ₂ concentrations raise almost to the pre-COVID-19 values in the 2020/21 winter

Nr 47
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Guido Masiello, Carmine Serio, Sara Venafra, Angela Cersosimo, Pietro Mastro , Francesco Falabella, Pamela Pasquariello
Titolo: Emissivity Based Indices for Drought and Forest Fire
Congresso internazionale IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 12 – 16 Luglio 2021, Bruxel, Belgio, virtuale.
Codice identificativo (ISBN): 978-1-6654-4762-1
DOI: https://doi.org/10.1109/IGARSS47720.2021.9553777
anno pubblicazione: 2021
ruolo svolto: co-autore alla pari
numero citazioni: 0
Accesso: limitato
Abstract: The present paper aims to illustrate new indices of vegetation-soil dryness based on the surface emissivity complemented with atmospheric water vapor mixing ratio or related parameters, such as the dew point temperature. The indices are based on satellite measurements and they have been built using the hyperspectral infrared sensor IASI (Infrared Atmospheric Sounder Interferometer) flying onboard the European Meteorological Platforms (MetOp). With the IASI instrument, we can retrieve simultaneously the surface emissivity and temperature, and thermo-dynamical parameters of air, such as temperature and water vapor mixing ratio profiles. Infrared surface emissivity (ϵ) is more closely related to surface type and coverage concerning the commonly used normalized differential vegetation index (or NDVI). By properly using surface emissivity in the infrared we defined a set of channels that are particularly sensitive to bare soil, green and senescent vegetation. IASI capability to sense the thermodynamic state of the atmosphere enables to retrieve both surface temperature (T_s) and dew point temperature (T_d) close to the surface. The difference between these two quantities ($T_s - T_d$) is a direct measure of the hydric stress at the surface. Emissivity indices complemented with the last one, obtained from the same measurements, enable the individuating region to be subject to a risk of drought, hence and forest fire, and allow us to overcome the problem of lacking space and temporal consistency. We applied this methodology to the region of Balgarska Polyana in southern Bulgaria which was hit by intense fires in August 2016.

Nr 48
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Guido Masiello, Carmine Serio, Sara Venafra, Angela Cersosimo, Pietro Mastro , Francesco Falabella, Pamela Pasquariello
Titolo: The Triplet Network Enhanced Spectral Diversity (T-NESD) Method for the Correction of TOPS Data Co-registration Errors

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for Non-Stationary Scenes
Congresso internazionale IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 12 – 16 Luglio 2021, Bruxel, Belgio, virtuale.
Codice identificativo (ISBN): 978-1-6654-4762-1
DOI: https://doi.org/10.1109/IGARSS47720.2021.9554439
anno pubblicazione: 2021
ruolo svolto: primo autore (presentazione orale)
numero citazioni: 0
Accesso: limitato
Abstract: In this work, a novel approach for the correction of misregistration errors in sequences of Terrain Observation with Progressive Scan (TOPS) Sentinel-1 SAR data is presented. The method represents a further evolution of the Enhanced Spectral Diversity (ESD) approaches. Remarkably, the developed algorithm is almost insensitive to the presence of large azimuth ground displacements due, for instance, to massive earthquakes, volcanic eruptions or glacier movements. Indeed, in such non-stationary contexts, the conventional ESD and network ESD approaches for the SAR TOPS data co-registration reveals problematic being co-registration errors and azimuth ground deformation components mixed out. Preliminary experiments conducted on a set of TOP SAR data related to the area hit by the Ridgecrest earthquake MW 7.1, California, on July 04 2019 confirm the validity of the theoretical framework.

Nr 49
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Guido Masiello, Antonio Pepe, Domenico Cimini, Filomena Romano, Elisabetta Ricciardelli, Carmine Serio
Titolo: Studio e analisi dei parametri chiave delle nubi: un approccio statistico basato sulle reti neurali
3° Congresso Nazionale dell'Associazione Italiana di Scienze dell'Atmosfera e Meteorologia (AISAM), 9-12 Febbraio, 2021, virtuale.
Codice identificativo (ISBN): n/a
Link: https://www.e-learning.univaq.it/videoconferenze/cetemps/mastro-poster.pdf
anno pubblicazione: 2021
ruolo svolto: primo autore (presentazione poster)
numero citazioni: 0
Accesso: limitato
Abstract: I parametri microfisici delle nubi influenzano direttamente il bilancio radiativo del sistema terrestre ed influiscono sulla stima indiretta di altri parametri geofisici come i gas serra, gli aerosol e la temperatura superficiale da misure acquisite da sensori per il telerilevamento ambientale. Per tale motivo, sin dai primi anni della meteorologia satellitare, l'analisi e lo studio delle caratteristiche delle nubi mediante dati di tipo ambientale rappresenta un passo significativo, soprattutto nel caso di misurazioni acquisite da sensori operanti nelle bande delle microonde e dell'infrarosso. La nuova generazione di sensori satellitari ad alta risoluzione spaziale e spettrale quali ad esempio i) l' Infrared Atmospheric Sounding Interferometer-New Generation (IASI-NG) e ii) il Microwave Sounder (MWS) promuovono stime più accurate dei parametri microfisici delle nubi, permettendo di indagare in maniera più rilevante il modo in cui le nubi influenzano il ciclo idrologico e le componenti radiative del sistema climatico terrestre. A tal proposito, questo lavoro indaga la capacità di stimatori statistici, implementati attraverso l'utilizzo di reti neurali "feed-forward" multistrato, di ricavare, a partire dalla combinazione di simulazioni dei sensori IASI-NG e MWS alcune tra le seguenti variabili chiave delle nubi, quali: i) i profili verticali del contenuto di acqua liquida ("cloud liquid water content" (CLWC)) e ghiacciata ("cloud ice water content" (CIWC)) delle nubi, ii) i loro valori integrati nelle colonne d'aria ("cloud liquid wather path" (CLWP) e "cloud ice wather path" (CLWP)), nonché il raggio effettivo di rilascio della nube ("cloud drop effective radius" re).

Nr 50
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Francesco Falabella, Antonio Pepe
Titolo: An Adaptive Statistical Multi-grid DInSAR Technique for Studying Multi-scale Earth Surface Deformation Phenomena
Congresso Internazionale IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 26 Settembre – 2 Ottobre 2020, Hawaii, USA, virtuale.
Codice identificativo (ISBN): 978-1-7281-6374-1
DOI: https://doi.org/10.1109/IGARSS39084.2020.9324535
anno pubblicazione: 2021
ruolo svolto: primo autore (presentazione orale)
numero citazioni: 1
Accesso: limitato
Abstract: In this study, we show the potential of an adaptive quad-tree-based decomposition method applied to Differential Synthetic Aperture Radar (DInSAR) data. Specifically, the proposed method exploits a multi-resolution scheme for the phase unwrapping of sequences of DInSAR interferograms and allows one to produce DInSAR deformation products at different scales of resolution. The selection of the used multi-grid is based on the analysis of the statistical properties of a sequence of interferometric phase, allowing to recognizing major deformation areas where phase unwrapping operations can be performed more efficiently, with a computational improvement and without losing significant information.

Nr 51
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Pietro Mastro , Pamela Pasquariello, Guido Masiello, Carmine Serio

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Titolo: Cloud detection from IASI hyperspectral data: a statistical approach based on neural networks
Congresso internazionale SPIE 2020, Remote Sensing of Clouds and the Atmosphere XXV, 21-25 Settembre 2020, virtuale.
Codice identificativo (ISBN): 9781510621558
DOI: https://doi.org/10.1117/12.2573326
anno pubblicazione: 2021
ruolo svolto: primo autore (presentazione orale)
numero citazioni: 1
Accesso: limitato
Abstract: In this work, an investigation of the capability of a statistical cloud detection scheme, implemented through the use of a multilayer feed-forward neural network, is assessed. The whole methodology is applied to a set of IASI L1C spectral radiances, covering the period January 2016-November 2016 and related to Eastern Europe and tropical areas. From a subsampled training dataset where the sky conditions are "certainly" known, we have performed the supervised learning of statistical features of the cloudy- and clear- sky conditions, where truth data have been taken from a cloud mask product of the Advanced Very High-Resolution Radiometer (AVHRR). Also, to improve the neural network classification performances: i) Principal Component Analysis (PCA) of IASI spectra and ii) neural network learning regularization techniques, have been used. Finally, the neural network classification analysis, evaluated during the training with a validation dataset and then with a test dataset, shows very good performance in detecting clouds, with an accuracy of about 93%.

Nr 52
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Guido Masiello, Angela Cersosimo, Pietro Mastro , Carmine Serio, Sara Venafrà, Pamela Pasquariello
Titolo: Emissivity based vegetation indices to monitor deforestation and forest degradation in the Congo Basin rainforest
Congresso internazionale SPIE 2020, Remote Sensing of Clouds and the Atmosphere XXV, 21-25 Settembre 2020, virtuale.
Codice identificativo (ISBN): 9781510621558
DOI: https://doi.org/10.1117/12.2573488
anno pubblicazione: 2020
ruolo svolto: co-autore alla pari
numero citazioni: 1
Accesso: limitato
Abstract: Vegetation stress is a major widespread problem in many countries because of climate change and anthropogenic activities. Deforestation and forest degradation phenomena may be caused for several reasons such as infrastructure development, agriculture, collection of wood energy, forest exploitation. Over the last decade, a severe decline in vegetation was observed in the Congo Basin rainforest, the second-largest tropical forest in the world, behind the Amazon. Therefore, actions are required to monitor and detect vegetation stresses to mitigate their negative impacts on human life, wildlife, and plant communities. Vegetation stress can be estimated using three different methods: field measurements, meteorological data, and remote sensing. The present study is mainly focused on satellite remote sensing. The main objective is to develop and test new indices of vegetation-soil dryness based on the surface emissivity. Until now, the problem has been attacked through indices such as the normalized differential vegetation index (or NDVI). The problem of NDVI is that it is a greenness index and is not capable to distinguish bare soil from senescent vegetation, whereas this distinction is important especially when forest degradation followed by eventual regeneration occurs and when dealing with semi-arid regions, where we could have desert sand. We propose to follow the strategy of using surface emissivity (ϵ), which is more closely related to surface type and coverage. By properly using surface emissivity in the infrared we can define a set of channels that are particularly sensitive to bare soil, green, and senescent vegetation. From these emissivity channels, we can derive a suitable emissivity contrast index or ECI, which is sensitive to green vegetation, senescent vegetation, and bare soil, therefore overcoming the NDVI limitation concerning its capability to distinguish bare soil from senescent vegetation. The analysis is performed with CAMEL (Combined ASTER and MODIS Emissivity for Land) database from 2000 to 2016.

Nr 53
Descrizione del titolo: Contributo in atti di convegno
Elenco autori: Carmine Serio, Guido Masiello, Pietro Mastro , Angela Cersosimo, Pamela Pasquariello, Sara Venafrà
Titolo: Simultaneous retrieval of OCS, and CO ₂ from the IASI shortwave spectral band: assessment of the accuracy of the retrieval products and validation with in situ observations
Congresso internazionale SPIE 2020, Remote Sensing of Clouds and the Atmosphere XXV, 21-25 Settembre 2020, virtuale.
Codice identificativo (ISBN): 9781510621558
DOI: https://doi.org/10.1117/12.2573351
anno pubblicazione: 2020
ruolo svolto: co-autore alla pari
numero citazioni: 1
Accesso: limitato
Abstract: To date, a limited understanding of the source and sink action for CO ₂ by vegetation persists because it is impossible to distinguish between the CO ₂ captured by photosynthesis processes and that released for operations related to plant respiration. In this context, carbonyl sulfide (OCS) is receiving increasing interest. The same as CO ₂ , OCS is captured by plants in the chlorophyll photosynthesis phase through catalysis of the same enzyme AC (carbonic anhydrase), but, unlike CO ₂ , the reaction is irreversible, i.e., the captured OCS is no longer released into the atmosphere. In this way, OCS could be a powerful potential proxy for photosynthetic capture of CO ₂ and, therefore, directly related to Gross Primary Productivity or GPP. The objective of this work consists of a feasibility study for the simultaneous estimation of CO ₂ and OCS with hyperspectral infrared observations provided by IASI (Infrared Atmospheric Sounding Interferometer) instrument. The OCS has a relatively intense band

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at 2060 cm⁻¹, which is well within the coverage of the IASI. This band has been analyzed with the aim of carrying out a complete assessment of the feasibility of estimating the columnar content of the OCS from satellite, simultaneously with CO₂. The analysis of sensitivity and error of the estimate has been carried out with the level 2 processor for IASI, developed by the Applied Spectroscopy group of the School of Engineering of the University of Basilicata. For the analysis, different (parametric and non-parametric) retrieval strategies were considered. It will be shown that the non-parametric strategy shows better performance. Finally, the results have been validated with in situ observations from the Mauna Loa station in Hawaii. The validation study has covered a period from 2014 to 2019, and we conclude that both OCS and CO₂ can be simultaneously retrieved from IASI band 3 with a very high degree of accuracy. A significant, unexpected, result from our analysis is that OCS concentration in the atmosphere is going down since 2017. We have shown that CO parallels this reduction as well, which could be the effect of world-wide actions to reduce the combustion and use of coal (a source of both OCS and CO) in industry and residential sectors.

Nr 54

Descrizione del titolo: Contributo in atti di convegno

Elenco autori: **Pietro Mastro**, Carmine Serio, Guido Masiello, Antonio Pepe

Titolo: On the combined use of Multiple Aperture SAR Interferometry (MAI) and Minimum Acceleration combination (MinA) techniques: A temporal investigation of large Earth's surface displacements

106° Congresso Nazionale Società Italiana di Fisica (SIF), 14-18 Settembre 2020, virtuale.

Codice identificativo (ISBN): 978-1-5386-7150-4

Link: <https://agenda.infn.it/event/23656/contributions/120543/>

anno pubblicazione: 2020

ruolo svolto: primo autore (presentazione orale)

numero citazioni: 0

Accesso: limitato

Abstract: This work presents an investigation on the combined use of the Multiple-aperture synthetic aperture Radar (SAR) interferometry (MAI) and the Minimum Acceleration combination (MinA) techniques, which are primarily devoted to measuring the along-track components of the Earth's surface deformation, and the generation of 3-D (2-D) displacement time series, based on the combination of multiplatform SAR data, respectively. Specifically, we present an innovative method to combine complementary information of the ground deformation collected from multi-orbit/multi-track satellite observations, to obtain the time-series of the 3-D components of the deformation in areas affected by large deformation episodes.

Nr 55

Descrizione del titolo: Contributo in atti di convegno

Elenco autori: **Pietro Mastro**, Francesco Falabella, Qin Zhao, Carmine Serio, Antonio Pepe

Titolo: Exploitation of a Multi-Grid Differential SAR Interferometry (DInSAR) Approach for the Investigation of Large-Scale Earth's Surface Deformation: Experiments on the Pearl River Delta (PRD) Region

Congresso internazionale ESA-MOST Dragon 4, 24-28 Giugno 2019, Ljubljana, Slovenia.

Link: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwui-uq-3Mb5AhUtx4UKHUXJAdUQFnoECAMQAQ&url=http%3A%2F%2Fdragon4.esa.int%2F2019DragonSymp%2Findex.php%2FMastro-Exploitation_of_a_Multi-Grid_Differential_SAR_Interferometry-130Poster_abstract_ppt_present2fbd.pdf%3Fpage%3DdownloadPaper%26filename%3DMastro-Exploitation_of_a_Multi-Grid_Differential_SAR_Interferometry-130Poster_abstract_ppt_present.pdf%26form_id%3D130%26form_index%3D2&usg=AOvVaw2Oy8vbQ8eWn7dPw2CsfNFK

anno pubblicazione: 2019

ruolo svolto: primo autore (presentazione poster)

numero citazioni: 0

Accesso: limitato

Abstract: In this study, we show the potential of an adaptive quadtree-based data decomposition method, applied to Differential Synthetic Aperture Radar (DInSAR) data. Specifically, the proposed method exploits a multi-resolution scheme for the phase unwrapping of sequences of differential SAR (DInSAR) interferograms and allows one to produce SAR deformation products at different scales of resolution. The selection of the used multi-grid is based on the analysis of the statistical properties of a sequence of interferometric phases. It allows recognizing major deformation areas where phase unwrapping operations can be performed more efficiently, with a computational improvement and without losing any significant information.

Nr 56

Descrizione del titolo: Contributo in atti di convegno

Elenco autori: **Pietro Mastro**, Antonio Pepe

Titolo: Adaptive Spatial Multi-looking of Differential SAR Interferograms Sequences using Circular Statistic

Congresso Internazionale 12th European Conference on Synthetic Aperture Radar (EUSAR), 4 – 7 Giugno 2018, Aachen, Germania

Codice identificativo (ISBN): 978-3-8007-4636-1

anno pubblicazione: 2018

ruolo svolto: primo autore (presentazione orale)

numero citazioni: 0

Accesso: limitato

Abstract: In this work, we discuss the potential of a new adaptive multi-looking technique that operates on a sequences of multitemporal differential SAR (DInSAR) interferograms. The core of the method is focalised on the use of circular (directional) statistics. Unlike other methods recently proposed in the literature, which identify homogenous distributed scatterers (DS) that

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are present into a resolution cell by analysing statistics of the complex valued single-look-complex (SLC) SAR images, the proposed method is exclusively based on the analysis of high resolution interferograms. It does not need of any other type of assumption, and it uses the two sample Kuiper test to check the statistical homogeneity of neighbouring SAR pixels. The technique can be applied to generate adaptive multi-look interferograms both at the native grid of full-resolution images and at the multi-look resolution scale. Also, the method can be simply complemented with other space/time noise-filtering techniques, such as the one adopted within the Extended Minimum Cost Flow (EMCF) based Small Baseline Subset (SBAS) processing chain, based on the optimal combination of multi-look interferograms. The experimental results demonstrate the validity of the method.

Nr 57

Descrizione del titolo: Contributo in atti di convegno

Elenco autori: Antonio Pepe, **Pietro Mastro**

Titolo: On the use of directional statistics for the adaptive spatial multi-looking of sequences of differential SAR Interferograms

Congresso Internazionale IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 23 – 28 Luglio 2017, Fort Worth, Texas, USA

Codice identificativo (ISBN): 978-1-5090-4951-6

DOI: <https://doi.org/10.1109/IGARSS.2017.8127825>

anno pubblicazione: 2017

ruolo svolto: ultimo autore

numero citazioni: 6

Accesso: limitato

Abstract: In this work, a new method for the noise filtering and the adaptive multi-looking of a sequence of multi-temporal differential SAR interferograms, which relies on the use of directional (circular) statistics, is presented. At variance with other similar approaches, which identify homogenous distributed scatterers (DS) in a resolution cell by analyzing the statistics of the complex-valued single-look-complex (SLC) SAR images, our method is exclusively based on the analysis of statistics of the phase interferograms, thus making no other assumptions. The developed technique can be applied to generate adaptive multi-look interferograms both at the native grid of full-resolution images and/or at the multi-look resolution scale. The preliminary experimental results, achieved by applying the proposed approach to a dataset consisting in 93 SAR data acquired by the ERS-1/2 radar sensors from 1992 to 2008 over the Gulf of Napoli and its surrounding area (South Italy) confirm the effectiveness of the proposed method.

Rapporti tecnici e manoscritti

Nr 58

Descrizione del titolo: Tesi di Laurea Magistrale in Ingegneria Informatica e delle Tecnologie dell'Informazione

Titolo: Sviluppo di algoritmi InSAR per lo studio di deformazioni della superficie terrestre di grandi dimensioni: la tecnica Multiple Aperture Interferometry (MAI)

- Abstract: La tesi sperimentale si proponeva di sviluppare alcuni algoritmi per lo studio di medie/grandi deformazioni della superficie terrestre mediante l'utilizzo della tecnica di interferometria SAR differenziale nota in letteratura come "Multiple Aperture Interferometry" (MAI), che permette di discriminare il campo di deformazione della superficie terrestre sia lungo la linea di volo del sensore che lungo la direzione di vista del sensore, ottenendo così una mappa di deformazione tridimensionale della scena osservata. L'uso di tecniche SAR interferometriche è necessario per recuperare serie temporali di spostamenti a lungo termine da dati SAR relativi alle aree osservate. In particolare, in questo progetto di tesi ho testato la tecnica dell'interferometria ad apertura multipla (MAI) in un'area caratterizzata da grandi deformazioni. Come sito di prova abbiamo scelto la depressione AFAR, un'area situata in Etiopia (Africa) che nel 2005 è stata colpita da un forte terremoto legato ai processi geologici della "Great Rift Ethiopic Zone".

Nr 59

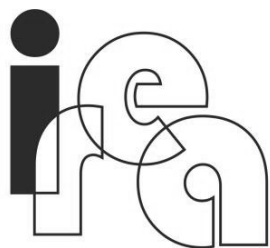
Descrizione del titolo: Tesi di Laurea Triennale in Scienze e Tecnologie Informatiche

Titolo: Sviluppo di un Algoritmo per il Riconoscimento di Target Distribuiti (DS) in Sequenze di Interferogrammi SAR.

- Abstract: Il progetto di tesi ha riguardato lo studio di alcune tecniche di elaborazione di segnali volte al telerilevamento ambientale ed in particolare al monitoraggio della superficie terrestre per l'analisi delle deformazioni del terreno tramite algoritmi di tipo interferometrico. Tale lavoro si è sviluppato su due linee principali: i) La prima si è orientata allo studio delle caratteristiche salienti delle immagini radar ad apertura sintetica (SAR), mostrando tramite alcuni esperimenti su dati reali come si possano ricavare informazioni (anche da un punto di vista statistico). ii) La seconda ha riguardato lo sviluppo di un algoritmo che permette di effettuare un'operazione di "filtraggio" del rumore che corrompe la differenza di fase tra coppie di immagini SAR (un cosiddetto "interferogramma") basata su una operazione di "mediatura" (multi-look) di tipo adattivo. A questo scopo, è stato realizzato un algoritmo che a partire da una sequenza di immagini SAR permette di riconoscere mediante l'analisi di un certo numero di interferogrammi SAR differenziali relativi alla stessa scena a terra oggetti che si estendono su molti pixel delle immagini SAR (target distribuiti) e che hanno le stesse caratteristiche.

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