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Project title: **The role of soil algae and cyanobacteria in post-volcanic colonization and succession**

Stay duration: 17.10. – 29.10. 2007

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Study trip to Etna and sampling activities

The stay in Italy was primarily focused on the collection of samples from lava flows of different age for the study of the role of algae and cyanobacteria in colonization and successional processes on Mount Etna volcano.

Necessary equipment and other facilities for sampling were prepared at home laboratories and transported from Firenze to Nicolosi located at the southern part of Etna.

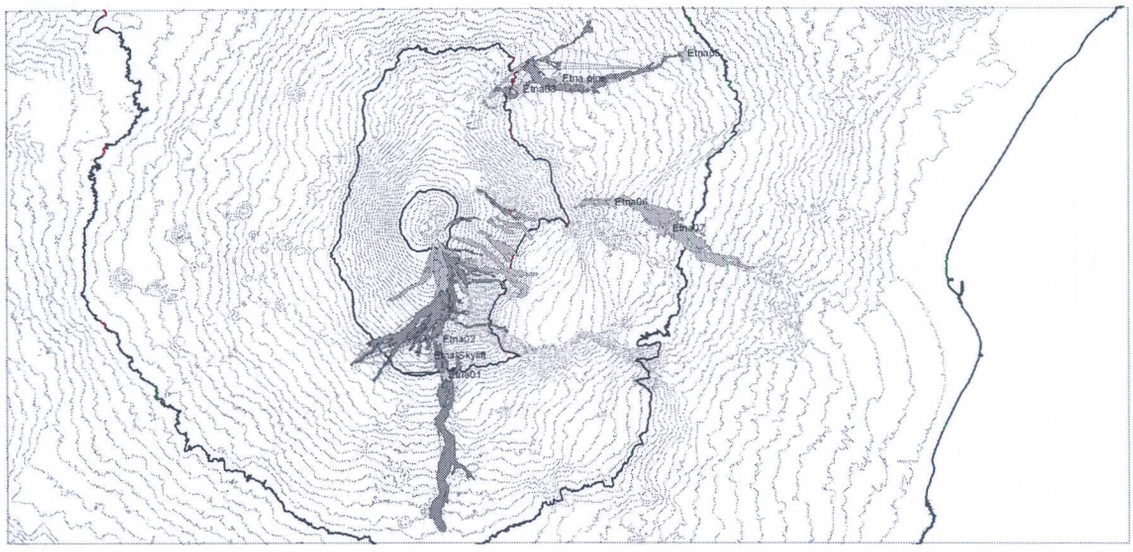
The first orientation visit of the area of our interest, planed to be studied, showed extreme variability of lava flows with respect to post-volcanic age, accessibility, presence of vegetation of higher plants, altitude, and human activity including tourism.

The second step was the consultation of Dr. Marco Neri, an expert - volcanologist at the Institute of geophysics and volcanology in Catania. The aim was to obtain detailed information about most recent eruptions and about their impact on the area of our interest to optimize selection of lava flows and sampling sites.

After consulting our ideas and present situation on Etna volcano with Dr. Neri we decided to establish our sampling sites on 3 lava flows. The altitude of sampling sites ranged between ca 1000 m asl and more than 2300 m asl. Two lava flows, with different expositions, resulted from the volcanic activity in 2002-2003, the first one was situated on the southern side of the mountain and finished near Rifugio Sapienza (about 1900 m. asl), the second onewas situated on the north-east flank and started close to Piano Provenzana (about 1900 m asl.). The third lava flow arose due to eruptions in 1971 on the eastern flank of Etna and finished near Fornazzo.

On each lava flow, samples were collected in a transect from 2-3 different altitudes. Sampling sites were chosen in accessible parts of lava flows which were not affected by any

evident human activity. Detailed position of each sampling site was measured using GPS. Sampling sites are shown on the following map (courtesy of Marco Neri, INGV Catania) reporting the investigated lawa flows on the Etna volcano.



Samplings were performed on rather flat parts of lava flows, if possible. Three randomly selected plots at about 10-15m distance each from other were examined at each particular site on each lava flow. Samples were taken aseptically from different substrates- new and old ashes, small lava stones, lava rocks, ashes below vegetation (mosses, higher plants), from lichens and mosses, when present, to cover the entire diversity of biota, especially of algae and cyanobacteria. Control samples were collected from ashes and soils in adjacent intact forests or from old (nearly 100 years) vegetated lava flows. *Quercus, Fagus, Pinus* forests in higher altitudes and *Castanea sativa* forest in a lower altitude were sampled. An old lava flow was dominated by *Astragalus siculus* Biv., *Tanacetum siculum* (Guss.) Strobl and *Rumex scutatus* L. forma *aetnensis* (C. Presl). The character of each sampling site was photo-documented.

Our sampling activities and plans were complicated by a sudden, rapid change of weather, strong wind, fogg, heavy rain, in higher altitudes even by snow and ice, making impossible to reach the highest parts of 2 transects and collect samples there.

Samples were kept and transported in sterile plastic boxes and plastic bags in cool boxes to prevent any changes in biological material. After returning from the field to the laboratory in Firenze, samples were sub-divided for planned chemical analyses, molecular analyses, microscopical and cultivation analyses and stored at appropriate conditions.

Preliminary results

Field observations

No visible colonization by lichens, mosses or higher plants was observed on lava fields from 2002/2003, except in the lowest part (at about 1100 m asl.) of the lava field on the north-east flank of Etna. Rocks from 1971 lava field were massively colonized by lichens with clear dominance of the species *Stereocaulon vesuvianum*. At least 4-5 other lichen species and 2-3 moss species were found on 1971 lava field rocks or in ashes. Depressions at sites from the lowest parts of this transect were colonized already by higher plants.

Laboratory work

First orientation light microscopic and stereo-microscopic observations and microphoto-documentation of biota developing on lava rocks were performed at the laboratory of CNR-ISE in Firenze with the collaboration of Dr. Claudio Sili. Samples from higher altitudes of 2003 lava fields seemed to be little colonized, with a prevalence of translucent or brownish directly unidentifiable filaments (probably micromycetes). Samples from low altitude in 2003 lava fields and especially from 1971 lava fields were colonized (sometimes massively) by green algae, exceptionally coccal cyanobacteria were observed. Species of coccal green algae (*Trebouxia, Chlorella, Coccomyxa* spp.) were revealed also as phycobionts of lichens colonizing lava. Biota assemblages connected with the lichen *Stereocaulon vesuvianum* were dominated by green algae, mostly from the family Radiococcaceae, but also microscopic fungi (both hyfae and spores), testate amoebae and other members of micro and mesofauna occurred.

Further direct stereomicroscopic, light microscopic and epifluorescence microscopic analyses of lava stones (rocks) performed at the Institute of Soil Biology (CR) revealed also the participation of filamentous green algae (*Klebsormidium* spp.) and of some interesting cyanobacteria in colonization processes.

First analyses of algal and cyanobacterial communities in ash samples both from lava fields and control forests have started using direct epifluorescence microscopy and cultivation methods after transporting samples to the Institute of Soil Biology. Colonization of ashes seems to be similar to colonization of lava rocks. Ash samples were also dominated by coccal green algae, in lowest part of 2003 lava flow dominated by filamentous green algae from the genus *Klebsormidium*, accompanied by *Stichococcus* and *Geminella*. Also some xanthophytes and common diatoms were observed in some samples, no cyanobacteria were isolated yet.

Also first measurements of pH of volcanic ashes were made. pH H_2O of ashes was found mostly neutral. Quantitative and qualitative prevalence of green algae is therefore rather

surprising as neutral or slightly alkaline substrata support usually higher development and diversity of cyanobacteria.

First results indicate that big variability in algal and cyanobacterial colonization in micro-scale corresponding with micro-niches seems to be typical phenomenon for the colonization of lava flow on Mount Etna volcano.

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The beneficiary of the STM grant

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