The effect of the 2019 eruption on the Island of Stromboli (Aeolian Islands UNESCO site, Italy).

Agnese Turchi\textsuperscript{1}, Federico Di Traglia\textsuperscript{1}, Tania Luti\textsuperscript{1}, Iacopo Zetti\textsuperscript{2}, and Riccardo Fanti\textsuperscript{1}

\textsuperscript{1}University of Florence, Earth Sciences, Italy (agnese.turchi@unifi.it)
\textsuperscript{2}University of Florence, Architecture, Italy (iacopo.zetti@unifi.it)

Stromboli island (Italy) provides an outstanding record of volcanic island geomorphological evolution, and of ongoing volcanic phenomena with the example of the “Strombolian” types of eruption. The vegetation of Stromboli includes endemic species, some of which are exclusive to the Aeolian Islands. The western side of the island is characterized by olive trees that were cultivated by exploiting terraces up to high altitudes. All this makes an unique landscape, results of interaction between volcanic activity, geomorphological evolution, and traditional land management. Wildfires at the island of Stromboli are common phenomena related to the fallout of incandescent material on vegetation. Wildfires with small extensions are usually generated by explosions more intense “major” explosions, while large-scale wildfire have been triggered by larger scale activity, called “paroxysms”.

On 3\textsuperscript{rd} July 2019 a paroxysm without long-term precursors has occurred, followed by lava flows from a vent localized in the SW crater area and sporadically from the NE one. Afterwards, on 28\textsuperscript{th} August 2019, a new paroxysmal explosion has occurred followed by strong volcanic activity, culminating with a lava flow from the SW-Central crater area.

This study is focusing on environmental aftermath of the 2019 Stromboli eruptions. The analysis of Land Cover (LC) and Land Use (LU) changes is used to describe the impact on the environment of the island. The detection of impacted areas is mainly based on the integration of very high-spatial-resolution PLEIADES-1, moderate-spatial-resolution SENTINEL-2 satellite imagery, and field surveys. Normalized Burn Ratio (NBR), Normalized Difference Vegetation Index (NDVI), and Relativized Burn Ratio (RBR) were used to map the areas covered by fires. NBR easily allows to easily identify the areas impacted by wildfire and the degree of severity of the damage. This index is calculated on two SENTINEL-2 images acquired on different dates before and after the fire (after a not excessively high number of days, especially if the area affected by the fire consists mainly of pasture or low bush). RBR is obtained as the difference between the NBR index of the images acquired before and after the event. LC and LU classifications has involved the detection of new classes whose details have been calibrated on different reduction scales from 1:2.000 to 1:10.000, following the environmental units that made up the Strombolian landscape. New LC and LU classifications are the result of the intersection between classes of CORINE Land Cover project (CLC) and local landscape patterns. Field survey has been useful to conduce semi-structured
interviews to the local population; the purpose of the social investigation was to collect detailed and direct information about damages.

The most impacted areas by tephra fallout are located in the south-western and southern part of the island, nearby the village of Ginostra. The results of multi-temporal comparison show that fire-damaged areas amount to 39% of the total area of the island. Artificial areas have not been particularly impacted (max 14% of decrease), whereas agricultural and semi-natural vegetated areas show a much more consistent decrease of 34% and 81%, respectively.