

## SUPPLEMENTARY MATERIAL

### **a) Composition of rock fragment fraction of SP2 soil profile from the bottom to the top along the soil profile.**

In the deepest 4Bwb horizon rock fragment fraction consisted mainly of medium and fine, rounded and elonged, brownish altered pumices.

The set of the Phlegrean pyroclastic levels, lying on the 4Bwb horizon, also in this profile contained the layers with the most abundant rock fragment content (up to 62,5): in particular, this set consisted at the bottom of a very gravelly ashy layer (3C2 horizon) with elonged fine and medium grey pumices lithics, overlying another very gravelly pumiceous layer (2C1 horizon) contained mainly angular grey pumices with a weakly weathered coatings (from mainly fine to up to 2 cm), and abundant lithics.

The overlying 2BC horizon, recording a decrease of the rock fragment content, had a composition similar to the underlying 2C1 level, mainly differing for more rounded grey pumices.

In the overlying 2Bw3 and 2Bw2 horizons, both recording a further decrease of the rock fragments, the latter were substantially similar to that of the underlying 2BC: pumices were grey, mainly rounded, and very fine, fine and medium (mainly <1 cm), with intense yellowish coating becoming yellowish-brown in the 2Bw2 horizon, accompanied by fine and abundant lithics.

The A2/2Bw1 horizon was composed by two parts: the A2 portion, where rock fragments were higher than the underlying 2Bw2 horizon, was characterized by a distinct different rock fragments composition with respect to the underlying 2Bw horizons: elements were very fine and fine (mainly < 0.5 cm), consisting of pumices and very abundant lithics, both mainly rounded; pumices were altered, grey, white and yellowish. By contrast, the composition of the 2Bw1portion, in which the content of rock fragments did not vary with respect to the underlying horizon, but was lower with respect to the A2 portion, was similar to that of the underlying 2Bw2 horizon.

Finally, the fragments contained in the upper A1 horizon, in which they decreased with respect to the A2 portion of the underlying A2/2Bw1 horizon, were similar to the underlying A2 soil portion, consisting of mainly fine rounded, grey, white and yellowish pumices with very abundant fine lithics, which indicated a genetic continuity between the two horizons in question.

### **b) Composition of rock fragment fraction of SP3 soil profile from the bottom to the top along the soil profile.**

In the deepest 6Bwb3 horizon, rock fragments consisted mainly of strongly weathered very fine and fine (<0.5 cm) brownish, rounded pumices with few fine lithics.

In the 5Bwb2 soil horizon, which recorded an increase of the content of the rock fragments compared to the underlying 6Bwb3 horizon, most of the fraction in question was fine and very fine lithics with mainly platy shape, while the few fine pumices were grey or brownish with rounded shape.

In the 4Bwb1 horizon, in which rock fragments increased with respect to the underlying 5Bwb2, the elements were both fine and very fine brownish, yellowish and white pumices and lithics, with different shape, from rounded to angular and platy.

This composition characterized also the underlying 4Ab horizon which, nevertheless, the rock fragment content was lower than the underlying horizon.

The underlying 3C2 horizon and 2C1 horizons constituted the set of Phlegrean pyroclastics: the first was an ashy layer, with only very few pumices; it was covered by the 2C1 gravel horizon which contained the highest content of rock fragments, consisting of mainly grey medium, fine and coarse pumices and subordinate lithics, constituting the substratum of the overlying three 2Bw soil horizons.

In the latter horizons, accordingly, rock fragments, which progressively decreased from the bottom to the top, consisted of mainly grey pumices and subordinate lithics; pumices had higher dimension in the 2Bw4 horizon (up to max 1 cm), which decreased up to max 0,5 cm in the 2Bw2 horizon, and were covered by a yellowish coating which was more intense in the upper 2Bw2 horizon. In the Bw1 horizon, rock fragments, which increased with respect to the underlying 2Bw2 horizon, had a higher amount of fine lithics, in addition to fine whitish and brownish pumices.

Finally, in the A horizon, the composition, as well as the content, of the rock fragments was similar to that of the underlying Bw1 horizon.

**c) The composition of rock fragment fraction of SP4 soil profile** was very similar to that of the SP3, considering that the two 4C3 and 5C4 horizons, which distinguished this sequence from that of SP3, were two sandy horizons in which no rock fragments occurred.