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Weathering processes as predisposing factors of the landscape evolution along plutono-metamorphic profiles of the Sila Massif, Calabria, southern Italy

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This work is aimed to join interdisciplinary research topics of weathering profile stages on plutonic (granitoid) and metamorphic (gneissic) rocks related to tectonic and landscape evolution of the western Sila Grande Massif (southern Italy). The grain-size of the studied samples is related to the parent rocks in response to physical and chemical weathering processes. Weathering processes produce an unconsolidated rock characterized by sand-gravel grain-size fraction for the granitoid rocks and by sand-silt grain-size fraction for the gneissic rocks. Chemical and mineralogical analyses confirm the granulometric observations. The difference between granitoid and gneissic rocks are mainly related to a higher content of quartz and feldspars for the first one rock type, whereas the second rock type shows higher content of neoformed clay minerals as well expandable phases. The main mineralogical changes concern the partial transformation of biotite and the partial destruction of feldspars, associated with the neoformation of secondary minerals (clay minerals and Fe-oxides) during the most advanced weathering stage; these processes also produce a substitution of the original rock fabric. All these petrological, chemical and mineralogical observations associated to microfractures and morphological variations occur on both plutonic and metamorphic original rocks and, thereby, affect the surrounding landscape processes. Generally, the granitoid profiles are regular and simple, characterized by gradual variation in the degree of weathering from bottom to top; where granitoid rocks show strong morphologies characterized by high relief energy and steep slopes, earth and debris slides, soil slips and earth flow can occur especially when fresher granitoids is near the surface and is covered by organic debris, colluvium, or soil. The gneissic profiles are characterized by structural complexity may be related to several factors such as presence of faults, high state of fracturing and the compositional heterogeneity of the gneiss. These profile characteristics are strongly related to the tectonic setting of the studied area. In particular, many fractured zone associated to fault planes and completely degraded rocks associated to thrust planes have been observed along the cutslope studied, where physical and chemical weathering produce argillified levels. These profile features represents a predisposing factor to the development of mass movements such as deep landslide (e.g., rock slide) and DSGSD (Deep Seated Gravitational Slope Deformation) in the fresher rocks. The weathering puzzle resulting from this preliminary study, based on the reconstruction of the weathering profiles in the plutonic and metamorphic rocks will help to evaluate the landslides susceptibility and hazard assessment in homogeneous geological context.