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Solifluction phases in Sierra Nevada during the Late Holocene

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The Sierra Nevada massif (Mulhacén, 3.478 m.) is a semiarid Mediterranean massif located in the southern Iberian Peninsula with an extremely low vegetation cover. Solifluction lobes are mainly concentrated in the headwaters of the highest cirques, especially widespread are in San Juan and Rio Seco, north and south exposed valleys, at heights of 2.500-3.000 meters.

Monitoring control of 17 lobes suggests that present solifluction is punctually active in Sierra Nevada. Only small displacements were reported in some lobes with large supply of water: near water channels or near late melting snow patches. The existence of many inactive solifluction lobes suggests that they should have formed under different climatic conditions than today. Sedimentological profiles show different solifluction phases during the Mid-Late Holocene in Sierra Nevada alternated with periods of slope stability and soil formation.

The stratigraphy of the lobes is composed by a succession of solifluidal deposits and organic layers. Solifluidal deposits are represented by coarse grained stone-rich layers with low amount of organic carbon while soil development is defined by higher values of organic carbon and finer material. The growth of an organic A horizon developed on the solifluction deposit; pollen concentration of these organic layers dated by AMS allows us to establish Holocene solifluidal phases in this massif.

We provide a solifluidal chronology during the Mid-Late Holocene in Sierra Nevada, showing that colder conditions such as the Little Ice Age (LIA) activated solifluction at heights of 2.500 m. in northern valleys and at 2.800 m. in southern cirques. By contrast, warmer periods like the Medieval Warm Period (MWP) induced soil formation

and slope stability.