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## A cropland application of Enhanced Weathering in the Mediterranean area to face climate change and preserve natural resources

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The goal of limiting the use of natural resources and combatting climate change has led to the improvement of agricultural techniques and the development of some Carbon Dioxide Removal (CDR) techniques, given their proficiency to sequester carbon from the atmospheric CO<sub>2</sub> and to store it in more stable forms within oceans, plants, soil, or other terrestrial environments. Among them, Enhanced Weathering (EW) is regarded as one of the most promising. This consists of amending soils with silicate minerals, such as olivine, so as to speed up the weathering process that naturally occurs in soils. This work aims to couple a model for the resolution of the agro-hydrological balance in the active soil layer of croplands (i.e., WATNEEDS model) and a dynamic mass balance model that explores ecohydrological, biogeochemical, and olivine dissolution dynamics, also estimating carbon sequestration rates (i.e., EW model). This latter is composed of different interacting components and takes into account important processes, such as the cation exchange.

From the operational point of view, the EW model is fed by rainfall data, and the outputs of the soil water balance (i.e., infiltration, evapotranspiration, leaching, and runoff rates) estimated by the WATNEEDS at the global scale at a 5 arcminute resolution. In this study, a regional application of both models is proposed to explore EW efficiency in various cropland areas in Sicily (Italy), the largest island of the Mediterranean basin, which is considered a hot spot of climate change. The methodological approach will be developed and tested for four different crops (i.e., olive and citrus groves, vineyards, and fruit trees) that are particularly widespread and profitable in the selected region. Apart from facing climate change, the goal of this study is also to preserve water, thus selecting the most suitable irrigation strategies in the context of a changing climate and olivine amendment prescription. This study may also provide a tool to decision-makers for an actual future application of EW, which can be valid for Sicily and for other parts of the world with similar climatic conditions, soil, and vegetation.