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An analysis of constraints to agriculture due to aridity in continental Europe: current conditions and future scenarios

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In the discussion on sustainable agriculture and in particular for the designation of agricultural areas constrained by bio-physical conditions (Less Favoured Areas), aridity is a relevant limiting factor for agricultural land use. In the past decades, many studies have addressed the issue of aridity in order to identify irrigation needs; moreover, the spatial distribution of arid conditions is key input information for agricultural land evaluation. In the present study, we apply daily soil water budget models at the European continental scale to derive a map of an aridity indicator, defined as the proportion of the growing season when the actual to potential evapotranspiration ratio is below a threshold; this indicator enables to identify areas severely constrained for agricultural land use. The calculations have been performed with the MARS weather database (precipitation and temperature) and the Soil Geographic Database of Eurasia, both available from the European Commission Joint Research Centre. The map of the aridity indicator results reasonably correlated with the spatial distribution of the Normalized Difference Vegetation Index (NDVI) which is known from the literature to be fairly correlated to the occurrence of arid conditions. The indicator has been evaluated also for conditions of future scenarios following climate change, allowing the identification of areas potentially lost or potentially gained for agricultural use. The paper discusses the expected variations under different climate change scenarios.