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Assessing the capacity to meet irrigation water needs for viticulture under climate variability in the Chilean Andes

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Abstract Viticulture in semi-arid mountainous regions remains entirely dependent on surface water resources (SWR) to satisfy crop water needs through irrigation. Climate change is expected to increase the risk of water shortage by altering the timing and duration of both hydrological and phenological events while increasing crop evapotranspiration. This study focuses on the estimation of IWR in the Claro River Basin Chile (4196 km^2) over the last decade (2002–2011). First, a process-oriented phenological model based on the accumulation of both chilling and forcing rates was built to predict the dates of budburst, full bloom and harvest events on the basin. Then a crop coefficient (K_c) was adapted to each phenological stage and water requirements were computed following a water balance approach. Analysis of the ratio between simulated IWR and observed SWR at a 10-day time step show that water needs have frequently been unsatisfied over the period considered. This work is a first step towards an in-depth analysis of the impact of hydro-climatic variability on the capacity of the river system to satisfy IWR under various climate change and water use scenarios.

Key words irrigation requirements; climate variability impacts; water shortage; snowmelt regime; Elqui River, Chile