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Recent trends in impacts-relevant climate in the world's Mediterranean-type climate regions

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Mediterranean-type climate regions are heavily dependent on cool season precipitation for water resources and agriculture. Declines in cool season precipitation have been noted in the Mediterranean, Chile, southwest South Africa and southern Australia while California has also been experiencing recent droughts. These changes have been attributed with some confidence to rising greenhouse gases, a poleward shift of storm tracks and Hadley Cell expansion. However, from the perspectives of climate hazards such as fire and heat and ecosystem impacts, spring and summer climate change are also important. For example, recent work shows that summer burned area in California's Mediterranean-type climate depends on winter precipitation but also on precipitation, temperature and vapor pressure deficit in spring and early summer. Here we consider trends over past decades in the impacts-relevant quantities of precipitation, surface temperature, humidity and vapor pressure deficit throughout the seasons for all the world's five Mediterranean-type climate regions. Trends from reanalyses are compared to those from CMIP6 models to attribute changes to radiative forcing and natural variability and the connections between change in thermodynamic quantities and the atmospheric circulation are explored. We show that across the Mediterranean-type climate regions human-driven climate change throughout the year is generating changes in impacts-relevant climate quantities that will create substantial challenges to societies and ecosystems.