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# Climate change, the Paris Agreement thresholds and Mediterranean ecosystems

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## Abstract

The UNFCCC Paris Agreement of December 2015 aims "to hold the increase in the global average temperature to below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels". At the scale of the Mediterranean basin, improved reconstructions of climate and ecosystem variability over the 10 last millennia provide insights about the implications of different warming thresholds for biodiversity and potential land use. For the different emission targets related to the Paris Agreement, we compare scenarios of climate-driven change in land ecosystems with spatio-temporal ecosystem dynamics reconstructed from pollen for the entire Holocene. We conclude that, in one century or so, anthropogenic climate change will likely change Mediterranean ecosystems in a way that nature has not been able to do in ten millennia. A significant expansion of desert is expected for southern Europe and northern Africa. It is crucial to limit the CO<sub>2</sub> concentration to 440 ppmv before 2040 and then to give a chance to the 1.5°C scenario, which is the only one that allow biome shifts to remain under the limits experienced during the Holocene. Warming by 2°C will likely have an effect rarely experimented during the Holocene (probability < 0.10) and the effect of a warming of +3°C or more on the Mediterranean ecosystems will unprecedented during the last 10 millennia.

**Keywords:** climate change, paleoecology, future scenarios, biome distribution

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