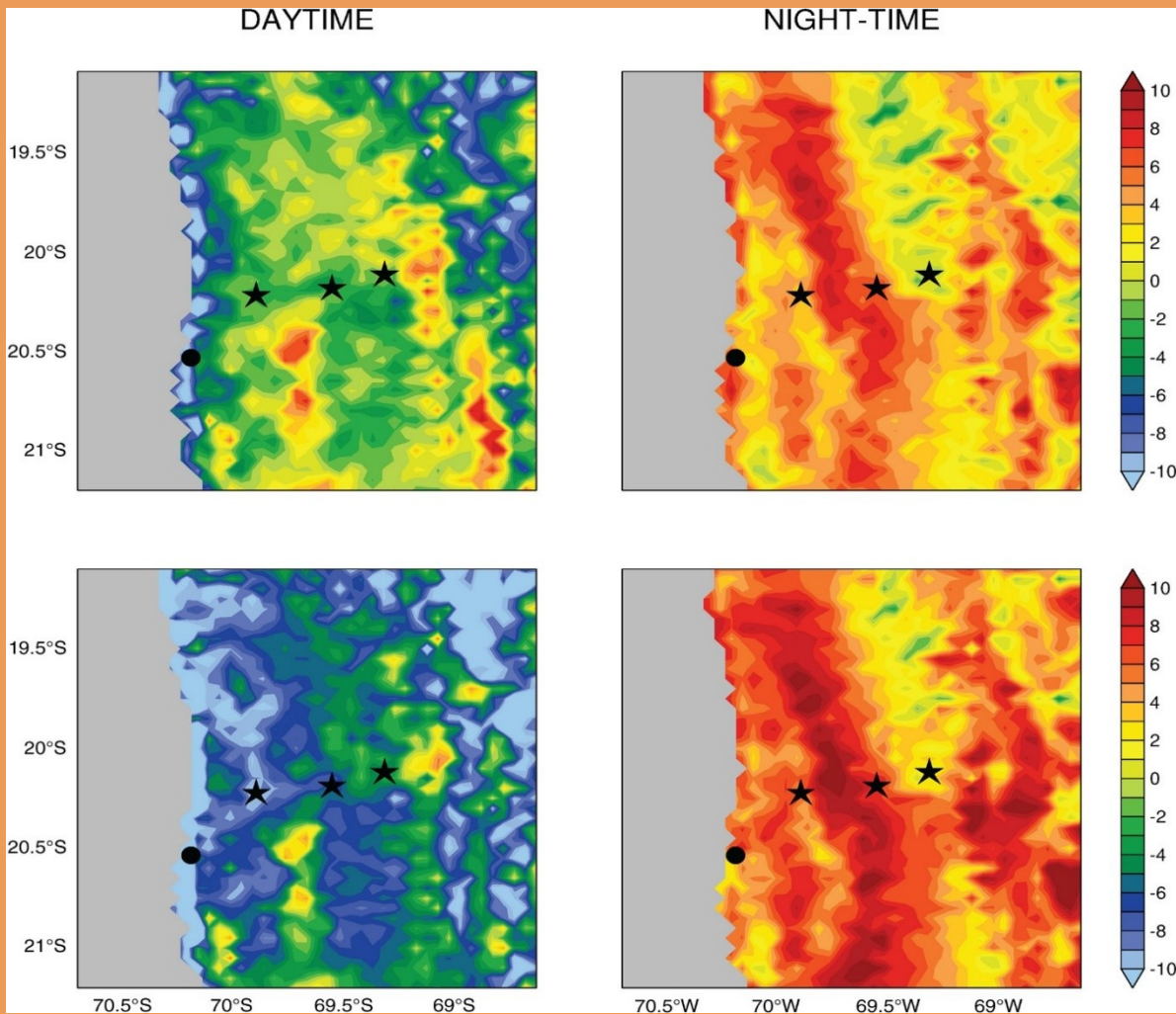


# A surface temperature and moisture inter-comparison study of the **Weather Research and Forecasting** model, in-situ measurements and satellite observations over the **Atacama Desert**



Good knowledge of the environmental conditions of deserts on Earth is relevant for climate studies. The Atacama Desert is of particular interest as it is considered to be the driest region on Earth and a good analogue environment for Mars.

We have performed simulations using the **Weather Research and Forecasting (WRF)** model over the Atacama Desert for two week-long periods in the austral winter season coincident with **surface temperature and relative humidity in-situ observations at three sites in the Atacama Desert (Chile)**.

We found that the WRF model generally overestimates the daytime surface temperature, with biases of up to 11°C, despite giving a good simulation of the relative humidity. In order to improve the agreement with observed measurements, we conducted sensitivity experiments in which the surface albedo, soil moisture, soil porosity, soil suction, saturated soil hydraulic conductivity and the b parameter (used in hydraulic functions and the quartz fraction) are perturbed. We concluded that an accurate simulation is not possible, most likely because the Noah Land Surface Model does not have a groundwater table that may be shallow in desert regions.

Comparisons of the WRF land model data with the Moderate Resolution Imaging Spectroradiometer (**MODIS**) orbiter instrument, show that while at night the satellite-derived and ground-based measurements are generally in agreement, during the day MODIS estimates are typically lower by as much as 17°C. This is attributed to the large uncertainty in the MODIS-estimated land surface temperatures in arid and semi-arid regions.

The findings of this work highlight the need for ground-based observational networks in remote regions such as the Atacama Desert where satellite-derived and model products may not be very accurate.

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