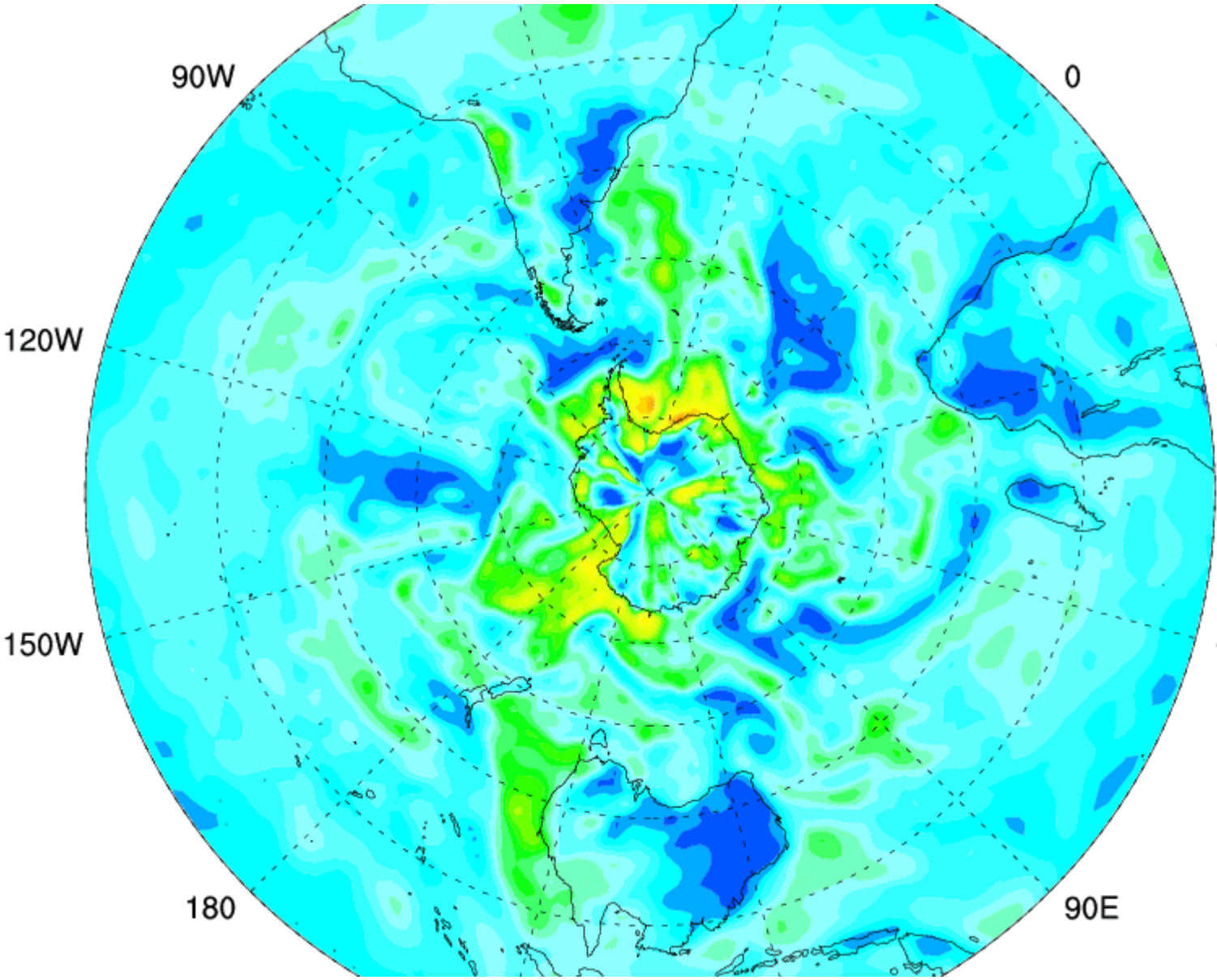
Aerosol-radiation-cloud interactions



Aerosols interact with the atmospheric system scattering and absorbing solar radiation, with a significant impact on atmospheric energy and hydrologic processes. Furthermore, aerosols alter the formation and precipitation efficiency of liquid-water, ice and mixed-phase clouds.

Summary

The Earth Sciences Department of the Barcelona Supercomputing Center – Centro Nacional de

Supercomputación (BSC) develops and maintains a state-of-the-art environmental model, NMMB/BSC-CTM. It is a fully online unified global/regional meteorological-air quality model. It solves the fate of global relevant aerosols and the atmospheric chemistry following an online approach. Currently the model provides mineral dust forecasts to the World Meteorological Organization (WMO) Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) Northern Africa-Middle East-Europe (NA-ME-E) Regional Center that is managed by a consortium between AEMET and BSC. The model has been selected as the reference mineral dust model for the recently created First WMO Regional Meteorological Center specialized on Atmospheric Sand and Dust Forecast, the Barcelona Dust Forecast Center. Additionally, global aerosol forecasts are provided to the International Cooperative for Aerosol Prediction (ICAP) initiative.

In this research line we plan to advance the understanding of the aerosol radiative forcing and the effects of the aerosol-radiation interactions (ARI) upon meteorology. It is well accepted that aerosols contribute to the radiative forcing of climate. Yet, their contribution is highly uncertain. Most aerosols scatter solar radiation, cooling the atmosphere. However, black carbon, mineral dust and brown carbon (organic aerosol with radiation absorbing properties) absorb solar radiation and warm the atmosphere. The overall degree of warming or cooling is still not clear due to model uncertainties in aerosol emission, dynamics, chemical composition, optical properties, and cloud processes. Further research on the life cycle of such aerosols and a better description of their optical properties are required.

Objectives

1. Impact of aerosol-radiation-cloud interactions upon weather forecasts and regional climate
2. Sensitivity to aerosol shape, chemical composition, size and optical properties

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