

Sea Salt Particles and Medicanes – a Non-quantified Feedback Circuit

Isabel Kraut

What is a Mediane?

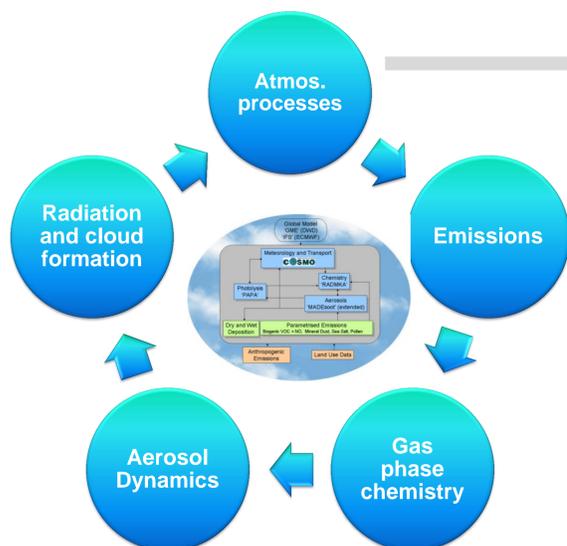
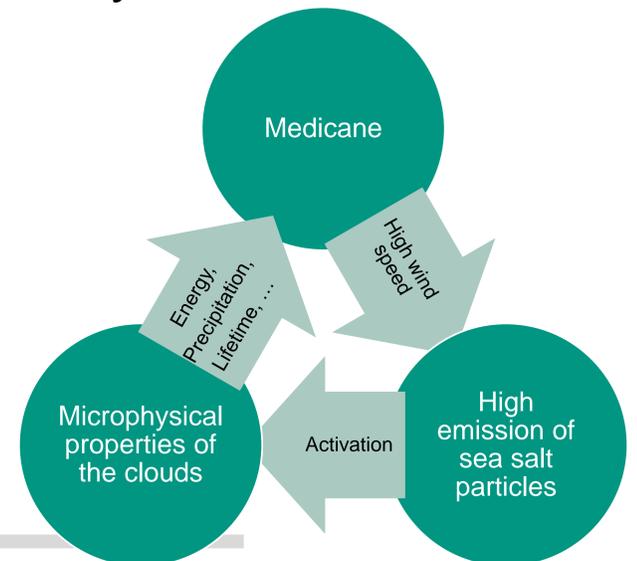
A Mediterranean hurricane is a tropical like cyclone over the Mediterranean Sea. It has similar characteristics like a tropical hurricane, e.g. a circular eye which is surrounded by an eyewall and a roughly axisymmetric cloud pattern.

Although Medicanes have a smaller diameter and are not that intense compared to tropical cyclones, the damage potential is high. High wind speed, heavy precipitation, high surf breaks and floodings are possible.

(EMANUEL, 2005; FITA ET AL., 2007; TOUS AND ROMERO, 2013; ROMERO AND EMANUEL, 2013)



Why Sea Salt?



Simulations with COSMO-ART

In my study I want to quantify the impact of aerosols on a Mediane. For this purpose, I simulate a Mediane, that occurred in November 2011, with the model system COSMO-ART (BALDAUF ET AL., 2011; VOGEL ET AL., 2009). In addition to the typical model systems used for numerical weather forecasts, COSMO-ART offers the opportunity to take aerosols and trace gases into account.

Two scenarios are performed within COSMO-ART, one including and one excluding sea salt particles. To account for the non-linear behavior of the system an ensemble is created for the two scenarios. It adds a small random perturbation at the beginning of the simulations.

Distilling the aerosol effect

I compare the precipitation fields of the two scenarios with the Displacement and Amplitude Score (KEIL AND CRAIG, 2009). This score quantifies of how accurately features are matched in terms of position and intensity (see figures to the right).

In the next step. I want to evaluate the contributions of sea salt particles and a random perturbation to changes in the precipitation pattern due to a displacement. For this purpose, I apply a factorial method (TELLER AND LEVIN, 2008) on the precipitation field for different displacement thresholds (not shown).

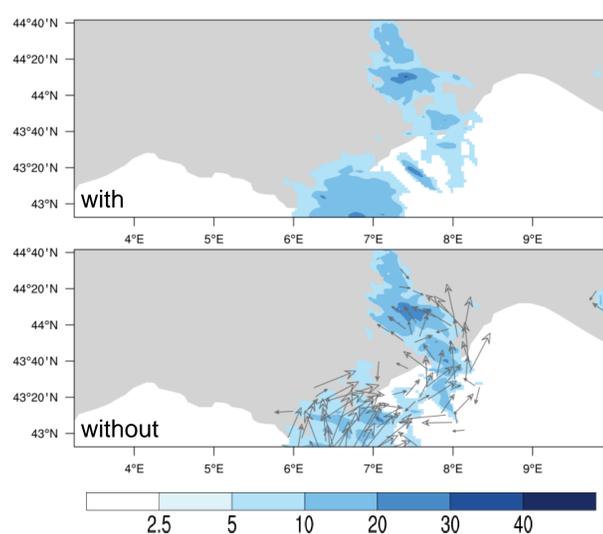
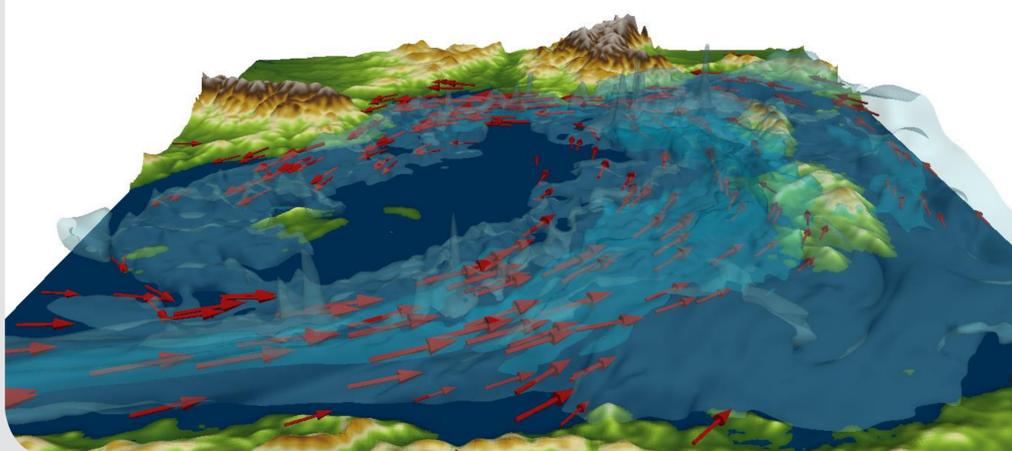
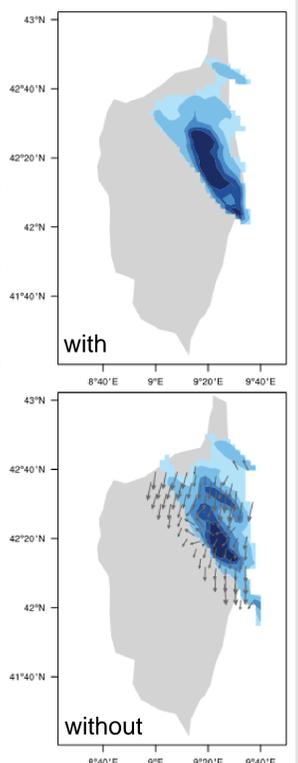


Fig. 3h accumulated precipitation in mm over (left) the French coast at 9 UTC at Nov 6, 2011 and (right) Corsica at 21 UTC at Nov 6, 2011 for the scenarios with (top) and without sea salt particles (bottom).

The bottom plots additionally show the displacement field achieved by the Displacement and Amplitude Score.



Summary

Medicanes create their own aerosol environment.

The effect of sea salt particles is distilled by combining the Displacement and Amplitude Score and a factorial method.

Sea salt particles cause mainly shifts in the precipitation field which result in big differences in local precipitation.