



Impact of Atlantic evaporation hot spots on southern Alpine heavy precipitation events

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In this study the impact of a transient event of high evaporation with a duration of about 2 days in an area of 10^6 km^2 over the Atlantic Ocean (evaporation hot spot) on a heavy precipitation event in the Piedmont region in November 2002 is investigated with the help of water tracers implemented in the Climate High Resolution Model (CHRM). With this water tagging technique a 11-day simulation has been performed. The results of the tagging studies show that the water precipitating in the Piedmont region during this event has three main sources: evapotranspiration from the land surface, evaporation from the Mediterranean and from the Atlantic, with the last one having the biggest share. This is partly due to an evaporation hot spot that appears some days before the heavy precipitation event at the back side of a trough that triggered both events. In this area on the Atlantic high wind velocities cause high evaporation of water which is then transported to the Piedmont region and considerably contributes to the extreme precipitation there.

In the climatological part of this study an analysis of Atlantic evaporation events has been performed based on ECMWF reanalysis data. Composite plots of surface latent heat flux and potential vorticity show a clear link between Atlantic evaporation hot spots and PV streamers. The result of trajectory experiments show that the moisture evaporated from the hot spot is transported to Europe, where it can contribute to precipitation events. Finally we used a data set of heavy precipitation events at the Alpine south side which also showed the occurrence of Atlantic evaporation hot spots preceding to the events.

Hence the evaporation of moisture from the Atlantic and its transport to the Alps related to an upper level trough should be considered as an important factor for the development of heavy precipitation events in the southern Alps.