Earth Syst. Dynam. Discuss., 6, C330–C333, 2015
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Earth System Dynamics
Discussions

Interactive comment on "Climatology of Vb-cyclones, physical mechanisms and their impact on extreme precipitation over Central Europe" *by* M. Messmer et al.

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Received and published: 2 June 2015

In this paper so called Vb cyclones are studied in three respects: climatology, underlying physical mechanisms, impact on extreme precipitation events.

Climatology of Vb cyclones is derived from reanalysis by means of a tracking procedure and with the adoption of several expedients in order to filter out from the ensemble "noise" (in particular shallow depressions). The methodology is quite laborious, but this is not surprising in view of the complex phenomenology of baric depressions near the Alps: due to orographic and thermal effects closed isobars with gradients exceeding 4 mb over 100 km are found over the western Mediterranean almost one third of the

time (1), but most of these depressions are shallow and have no meteorological impact; only a few are associated with deep cyclogenesis (2,3). The proposed statistical procedure is not particularly stable: only 62% of selected Vb cyclones coincide with those identified by HofstaİĹtter and Chimani (2012).

In agreement with preceding literature, some of the selected cyclones can be associated with intense precipitation in particular in summer: high and weak precipitation events (HPE and WPE) associated with Vp cyclones are identified from observed precipitation. Analysis of precipitable water and moisture fluxes shows that both are not discriminant with respect to the occurrence of HPE and WPE. Also this result is not surprising as: - High values of precipitable water (typically in summer in middle latitudes) not necessarily imply intense precipitation. In fact, to my knowledge, no attempt to identify adequate predictors of intense precipitation (CAPE for example) has ever been successful for what concerns Mediterranean cyclones. - Sensible and latent heat release from the ocean is associated with high temperature contrast between ocean water and overlying air which usually occurs during cold frontal outbreaks which are irregularly correlated with cyclogenesis: in a typical "Genoa cyclone" development pressure is rapidly lowering when the cold front associated with the primary cyclone is still behind the Alps and no relevant thermal contrast can yet be observed over the Mediterranean. It could be useful to consider soil moisture in continental areas prior to the period of intense precipitation: some authors (4) show that a seasonal change exists in the moisture source for the Alpine regions: predominantly Mediterranean and/or Atlantic in the winter, continental in the summer.

As to physical mechanisms, based on an analysis of composite flows, the authors conclude that: "The fact that unlike humidity, the large-scale dynamic behaviour of the atmosphere allows a clear differentiation between the HPEs and WPEs, leads us to the conclusion that the thermodynamic state of the atmosphere only plays a secondary role in triggering heavy precipitation associated to Vb-events." Investigating large scale flow in connection with cyclones selected on the basis of their trajectory

makes sense to me; as a matter of fact I would expect the trajectory to depend more on the large scale “background” flow than on the local cyclone properties. But the problem should, in my opinion, be studied at more depth. For example, in a recent paper (5)the flooding event over central Europe of June 2013 is analysed in view of some dynamical processes like Rossby wave breaking (RWB) e warm conveyor belt (WCB). Also the speed of motion of cyclones can be relevant: for example, slow Mediterranean cyclones, having sufficient time to pump up water from the ocean can give rise to very intense precipitation (6,7).

In conclusion, the paper addresses an interesting problem, presents interesting work and, overall, is adequately written (the conclusive section is perhaps a little too long and qualitative); however, in the present form, the paper is somewhat inconclusive: I would suggest improvement of the analysis of dynamical processes before publication.

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Interactive comment on Earth Syst. Dynam. Discuss., 6, 907, 2015.