Humidity Transport Pathways within Mediterranean Cyclones during HyMeX-SOP1

Synoptic-scale weather systems are responsible for the largest part of the three-dimensional water transport in the mid latitudes. This water transport is especially important in the Mediterranean region, where it can play a crucial role in producing heavy precipitation events.
This work examines humidity transport pathways in weather systems during IOP 8 and IOP 19 using Lagrangian trajectories (Wernli and Davies, 1997). In both cases, very high precipitation fell (widespread about 100 mm per day, locally up to 250 mm within 24 hours), but moisture uptake areas and moist air pathways were very different. The trajectory analysis shows considerably more details than classical weather charts do. We investigated the regions of origin of humidity, its area and speed of ascent, phase transformations along the path with subsequent precipitation. It gets obvious, that between large scale and longtime slow ascent (lifting) and small scale and short time ascent (convection) a large variety of types of vertical motion exists. We distinguish between convective and advective moisture transport and intermediate hybrid types of vertical motion and the resulting effects on precipitation pattern. While the convective transport and locally restricted forced lifting was most important during IOP 8 downstream a slow moving cut-off low over Spain, the moist air was slowly rising along a large scale trough and upstream the Apennin and Alpine Mountains during IOP 19.