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Coherence between multi-instrument and multi-model atmospheric moisture retrievals and a ground-based Raman-lidar reference in the framework of the HyMeX SOP 1

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The Mediterranean area is one of the main climate change hot spot regions where the water cycle needs to be better understood in order to make progress on the predictability of high-impact weather events and their evolution with global change. Characterizing the water vapour variability across the Mediterranean basin at hourly to synoptic timescales is of paramount importance to advance knowledge on the life cycle of heavy precipitation events and improve forecast in numerical weather prediction models. However, such a characterization based on a single instrument or model remains elusive and a multi-instrument, multi-model approach is needed to properly apprehend the water vapour variability at the relevant timescales, especially over data scarce regions such as oceans and seas. This approach has been undertaken during the Hydrological cycle in the Mediterranean eXperiment (HyMeX) in September and October 2012 during which part of observational effort has been established on Menorca to characterize the upwind marine low-level flow, essential to determine the strength, timing and precise location of the subsequent precipitation at the Mediterranean coastline. The ground-based Water vapor Raman Lidar (WALI), the airborne LEANDRE-2 DIAL water vapor lidar and boundary layer pressurized balloons were implemented during the first Special Observing Periods (SOP 1) and contributed to characterize water vapour variability in the vicinity of the Balearic Islands. Furthermore, analyses from regional and global numerical models (AROME-WMED, ECMWF and WRF) were also available over large domains encompassing part or the whole of the Western Mediterranean basin. We will present the comparisons of the water vapor mixing ratio profiles and water vapor integrated content derived from these different data sets and we will show that good agreements is found between them. This work is an essential step towards ensuring that the water vapour datasets (both measurements and simulations) acquired during the SOP 1 of HYMEX are consistent, self-coherent and can be used unambiguously in order to analyse the variability of the water vapour field over the Western Mediterranean Basin.