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Impact of two-way ocean atmosphere coupling on precipitation forecast for the coastal Adriatic region

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A two-way coupled ocean and atmosphere modeling system has been developed at Slovenian Environment Agency and the National Institute of Biology (Ličer at al., 2016). The system comprises 4.4 km ALADIN/ALARO limited-area numerical weather prediction model and Princeton Ocean Model (POM) for Adriatic sea and uses Mediterranean Forecasting System (MFS) as ocean component outside the POM model domain. The heat and momentum fluxes between sea surface and atmosphere as estimated by ALADIN model are transferred into POM every model time stamp, and sea surface temperature (SST) is returned from POM to ALADIN. A positive impact of such a coupling system with respect to one-way coupling was demonstrated mainly for sea surface variables. In this contribution we study the impact on atmospheric variables, mainly precipitation. Unlike in the previous work where the atmospheric part of the system was reinitialized every day from external (non-coupled) data assimilation cycle, we implement the two-way coupling in the data assimilation cycle for ALADIN. Rather than running long-term simulations which would presumably lack observational information given no data assimilation for the ocean component, we focus on several precipitation events and assess performance of the atmospheric model by running the coupled system for a short warm-up periods beforehand the events. We evaluate several approaches to applying the one- or two-way coupling (in the warm-up period, during the main forecast, or both) and several approaches to using SST information in ALADIN in the one-way coupled mode (POM, MFS, global atmospheric model). Preliminary results suggest that it is important that two-way coupling is applied not only during the long term (e.g. 72 h) forecast but also already in the data assimilation cycle prior to event.