



A modelling hindcast of four waterspouts along the Tuscany coast with sensitivity tests to SST anomalies

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As reported by the European severe weather database, waterspouts are a frequent phenomenon along the Tyrrhenian coasts. They are more frequently observed during autumn than other seasons and, although less intense than tornadoes, can cause relevant damages when they make landfall. Based on information from weather station data, newspaper articles, eye-witness reports, photos or videos of the damages, the area of the Rosignano Solvay municipality (central coast of Tuscany, Italy) has experienced four of such high-impact events in the last 10 years. We present the numerical reconstructions of the atmospheric conditions that led to the waterspout events. The Meso-NH model, fed by ECMWF global analyses, is used to produce short-term and high-resolution (grid spacing up to 100 m) predictions. By looking at the atmospheric parameters correlated to the waterspout formation, we speculate about the ability of numerical forecasts in reconstructing the favorable conditions for waterspouts formation and development. We also discuss any usefulness of such short-term forecasts for issuing tornado-probability alerts. Furthermore, to investigate any possible influence of warmer sea surface temperatures (SSTs) on waterspout formation, we performed a sensitivity test by changing (namely increasing) SST values by approximately 1 K in a limited coastal perimeter. This is done to mimic the local warming effect that can occur due to the flux of hot water from the drainage ditch of the Solvay industrial plant. In such inner grid, a simplified 1-D ocean mixed layer model is used to account for the interaction between the sea and the atmosphere and correct the fluxes due to gustiness and precipitation. Preliminary analysis show that warmer sea temperatures (in the way they were simulated) may increase the probability of occurrence of waterspouts.