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Sea-Salt Aerosol Mass Concentration Oscillations After Rainfall, Derived From Long-Term Measurements

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Sea-salt aerosol (SSA) is the dominant contributor to cloud condensation nuclei over ocean areas, where wind speed is significant. Thereby, SSA could affect cloud formation and play on important role in the Earth weather and climate. Rainfall could produce large impact on SSA concentration due to wet removal processes. An analysis of changes in sea-salt aerosol (SSA) concentration after rainfall is essential for a deeper understanding of the process of SSA loading in the boundary layer. To our knowledge, so far, no experimental research on SSA concentration changes after rainfall has been carried out. The current experimental study focused on analyzing time variations of SSA mass concentration after rainfall, on the basis of long-term daily SSA measurements during the three-year period 2006 – 2008, at the tiny Mediterranean island of Lampedusa (Central Mediterranean). Considerable effort was made in order to collect and analyze SSA measurements, on a daily basis, over the three-year period. To study the effect of rainfall on SSA time variations, we used the superposed epoch method. We applied this approach to differing rainfall events related to different months and atmospheric/ sea conditions. In order to remove the effects of different initial conditions, we used SSA concentration anomalies, which are a deviation of daily concentrations from their monthly mean level. Local factors, such as sea-salt production in the surf-zone, located in the vicinity of the monitoring site, can also contribute to measured sea-salt concentrations. However, the effects of those local factors on SSA concentration anomalies are random. Integrated processing was applied to SSA anomalies, in order to filter out random variability. Observational evidence of SSA mass concentration oscillations after rainfall was obtained. The knowledge of SSA variations after rainfall is important for validating rainout parameterization in existing sea-salt aerosol and climate models.