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Estimation of aerosol water and chemical composition from POLDER/PARASOL satellite retrievals of aerosol properties.

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Remote sensing of aerosols provides important information on the atmospheric aerosol abundance. Due to the hygroscopic nature of aerosol particles, their optical properties reflect not only the dry aerosol properties but are also influenced by atmospheric humidity. Remotely sensed aerosol optical properties are used to validate aerosol-climate models, but a more consistent validation requires knowledge of the actual aerosol dry chemical composition. We present results from a model that estimates the dry aerosol chemical composition and aerosol water, using remotely sensed aerosol properties from POLDER/PARASOL (e.g. optical thickness, single scattering albedo, refractive index and size distribution) and ECMWF relative humidity as input. The model applies a minimization technique to derive column-integrated quantities of sulfate, ammonium nitrate, sea salt, organic matter, black carbon and dust, for the aerosol fine and coarse modes. First, we compare POLDER data with data from AERONET to assess the accuracy and consistency of the input data, and discuss the influence of uncertainties in optical parameters (especially the refractive index) on the model results. Then, the model is applied to POLDER measurements at several near-oceanic sites. The results are used to investigate the monthly and seasonal variability of aerosol abundance and composition at these sites.