The effect of inhomogeneity of wet sea salt aerosols on direct radiative forcing

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In a humid environment, wet sea salt aerosols are always considered to be spherical in most climate models. However, sea salt aerosols are inhomogeneous during hygroscopic processes (deliquescence and crystallization). As relative humidity (RH) increases or decreases, sea salt particles are coated by water or crystallized in droplets. In this study, we used a two-layer sphere model to simulate optical properties of wet sea salt in specified ranges of RH. We have found that the asymmetry factor of coated sea salt is much lower than that of the volume equivalent homogeneous spherical sea salt, indicating stronger backscattering of coated sea salt. To assess the impact of the aforementioned inhomogeneity on direct radiative forcing of sea salt aerosols, we used the Community Earth System Model. Results show that on global scale the inhomogeneity of wet sea salt has limited effect on direct radiative forcing; however, over the coastal regions bias of direct radiative forcing between inhomogeneous and homogeneous sea salt aerosols could be up to 10% [1]. From a remote sensing perspective, in coastal regions, both the nonsphericity and inhomogeneity should be considered to compute the optical properties of sea salt aerosols due to a large range of RH [2].

References

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