Aerosol Optics, Climate Change, and Satellite Remote Sensing

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The common perception of climate change is dominated by the greenhouse effect due to gases such as carbon dioxide. Aerosols influence the earth's direct radiative forcing and climate largely through modifying the planetary albedo, which is the whiteness of the planet as seen from space. If aerosols are whiter than the underlying scene, they increase the planetary albedo, have a negative radiative forcing and cause cooling (more solar energy is scattered back into space); otherwise if they appear darker, they decrease the planetary albedo, have a positive radiative forcing and cause heating (more solar energy is retained by earth). In addition, aerosols can continue to cause radiative forcing after deposition. In particular, dark aerosols can strongly decrease surface albedo after deposition on high-albedo surfaces such as snow and ice. Here, we are discussing the importance of aerosol optics and its measurement in the laboratory and from satellites including a new concept for satellite remote sensing of aerosols in the twilight zone.