



## **Studying cloud aerosol interactions from space – advantages and challenges**

Ilan Koren, Orit Altaratz, Uri Wollner, and Guy Dagan

Weizmann Institute of Science, Department of Earth and Planetary Sciences, Rehovot, Israel (ilan.koren@weizmann.ac.il)

As clouds form a complex dynamical system, theoretical studies may offer several attractors for the system to converge to. Such attractors can suggest trends that link changes in aerosol properties to changes in clouds' ones. The variety of possible trends can reflect the reality or can be the result of the research approach. Differences in the way by which the physics is described (say in the turbulence scheme), or in the configurations of the numerical schemes (say bin vs. bulk) may result in significant differences in the cloud (and cloud field) properties. Therefore, it is not uncommon to find reports of contradicting conclusions to this important problem.

Observations, despite having numerous problems and limitations, are the only way by which one can find if there is a preferred trend. To do so one has to slice the data to narrow cloud types, environmental conditions and aerosol properties. Furthermore, there are many artifacts or alternative interpretations that one has to consider as a part of the analysis. Most importantly, one has to "ask" the data the right questions, trying to distil clear and coherent set of evidences that will allow not only to find the preferred trend, but also to offer a physical mechanism that later could be further tested with the aid of other approaches, such as numerical models or in situ measurements.

Here we will describe some of the challenges of such studies and show how we link observations and numerical models to explain contradicting reports of aerosol interaction with warm convective clouds.