Recent evolutions in GRASP concept: Achievements and Challenges in aerosol remote sensing

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The presentation discusses recent evolution of GRASP retrieval approach and it overviews relevant algorithm and software updates, and discusses the achievements and challenges. The later also reflect the tendencies in overall aerosol remote sensing evolution, as well as, successes and issues that recognized by the broad remote sensing community. Indeed, the GRASP [1] is opensource versatile algorithm developed for diverse remote sensing applications including passive and active observation from ground and space and their synergies. The benefit of GRASP versatile concept is that, improvements in forward model or numerical inversion introduced for any specific application, as a rule, becomes beneficial for several applications. This portability of advances helps both to accumulate positive experience and to identify the challenges common for many remote sensing applications.

In these regards, several accomplishments can be mentioned including:

- generation enhanced retrieval products using multi-angular polarimetric observations;
- realizing and demonstrating advantages of multi-instrument retrievals combining different types of observations: passive & active, polar & geostationary, satellite & ground-based;
- development of GRASP/Component approach aligning remote sensing with climate models;
- retrieval aerosol size information from direct Sun and aureole observations;
- generation of the dynamic retrieval errors for all ground-based and satellite applications.

In addition, new developments were introduced in GRASP for :

- retrieval of aerosol and gases using of synergy photometric and hyperspectral observations;
- investigating efficiency of combining aerosol retrieval with DAOS (Differential Optical Absorption Spectroscopy) for improved aerosol profiling using passive remote sensing;
- analyzing possibilities to improve remote sensing retrieval in presence super-coarse dust particles with radii over 15 microns;
- testing advanced approaches for modeling particle non-sphericity and inhomogeneity in aerosol retrieval;
- estimation of PM2.5 and PM10 from nephelometric and remote sensing measurements,
- etc.

References

[1] Dubovik, O., et al., "A Comprehensive Description of Multi- Term LSM for Applying Multiple a Priori Constraints in Problems of Atmospheric Remote Sensing: GRASP Algorithm, Concept, and Applications", Front. Remote Sens. 2:706851. doi: 10.3389/frsen.2021.706851, 2021.

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