# Light scattering on ice crystals of cirrus clouds for application in EarthCARE inversion algorithms

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The study of cirrus clouds is crucial for climate modeling and improving calculations of the planet's radiation balance. Since direct methods of studying cirrus clouds are very expensive, the primary approach is to use active and passive remote sensing methods. While passive methods are more cost-effective, only polarization lidar sensing methods can provide a comprehensive understanding of the microphysical cloud's profile.

The main challenge in interpreting lidar data lies in the absence of a theoretical solution for light scattering on ice crystal particles in cirrus clouds. This is primarily due to the dependence of the light scattering problem on numerous microphysical parameters, such as the shape, orientation, size, and concentration of particles within the cloud[1]. Until recently, there was no available method to solve this problem. Only last years, a solution became attainable with the introduction of the physical optics method[2, 3].

The report presents the database of solutions for the light scattering problem involving various ice crystal particles commonly found in cirrus clouds. These particles include hexagonal ice plates and columns, droxtals and bullets, irregular particles, and particle aggregates. Special attention is given to cases where particles in the cloud reveal preferential spatial orientation. The solutions were obtained for particles ranging in size from 10 up to 1000 μm, considering the wavelength of the EarthCARE's ATLID lidar – 0.355 μm and of CPR – 3.18 mm.

## References

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