Master thesis: **Atmospheric lensing**

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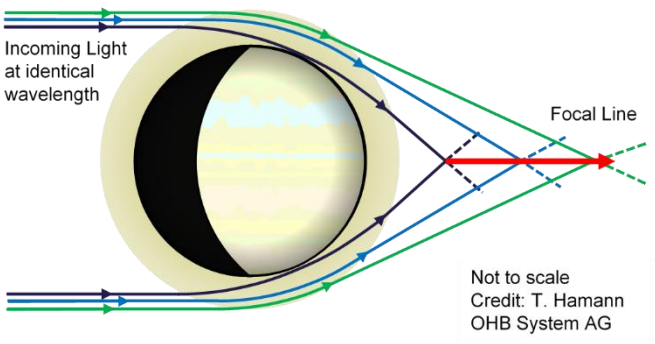
Light when passing a gravitating object like the Earth, another planet or Solar system object, a Newton Star or a Black Hole will be focused behind the body due to gravity as well as due to the atmosphere the body may have. There are several regions on the focal line: (i) the shadow region where no light arrives (like the shadow of Black Holes), (ii) a partially illuminated part of the focal line where due to the extension of the light source only a part of the light rays arrives, (iii) the outer part of the focal line where the maximum number of light rays arrives.



The intensity of the light behind the object depends on the size of the body, its mass, and the atmosphere. For our consideration gravitational effects which are related to the mass will not be relevant. The main influence comes from the size and the properties of the atmosphere, which depend on the density, temperature, composition, and also on the average state of motion and turbulence. These properties influence the in general complex refraction index which influences the amplitude as well the phase.

The focusing can be calculated on a ray optics approach. Here we also like to consider the phase of the light which in general will lead to interference effects.

The atmosphere of the object influences the intensity along and in the vicinity of the focal line. On the other hand, from the shape of the intensity one may also get additional information about more global properties of the atmosphere of the Earth. That is, within this project also environmental research regarding the Earth can be made. This also holds for other objects with an atmosphere.

This work will be carried through within the project “Atmoscope” organized in preparation of a proposal of OHB concerning the search for exo-planets, exo-moons and other faints objects in the universe.

Possible master topics:

1. Influence of temperature, turbulence, and Earth rotation on the intensity near to the focal line
2. Lensing beyond the ray optics approach

Requirements (not mandatory): Knowledge in programming, background knowledge in Astrophysics and Atmospheric Physics