

## ***Interactive comment on “Development and validation of satellite based estimates of surface visibility” by J. Brunner et al.***

**I. Katsev (Referee)**

katsev@light.basnet.by

Received and published: 26 November 2015

### **1) General comments**

The paper presents a method to estimate the visibility at the ground level using an atmosphere AOD and cloud optical thickness measured by a satellite spectral sensor. The method is developed using MODIS measurements as a proxy for the GOES-R ABI instrument. The method is validated using large volume of data received in the independent ASOS surface visibility measurements. Authors consider feasibility and accuracy of this technique for estimations of the surface visibility depending on various parameters, particularly on the accuracy of the AOD measurements. The presented method is based mainly on the regression relations. However from the re-

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viewed manuscript it is difficult to understand how to implement this method and how the aerosol multiple regressions are taken into account in its implementation. This is especially important regarding that "the ABI aerosol visibility blended retrieval uses a 20/80% weighting of the first guess and multiple regression aerosol visibility estimates".

### **2) Specific comments**

1. The GOES-R ABI visibility algorithm assumes that the aerosols reside within the planetary boundary layer and the extinction coefficient is constant, i.e. doesn't depend on altitude. And why the authors did not try to use a different, more realistic model of the aerosol distribution in the boundary layer, for example, exponential one?
2. On pp. 11258 and 11259 authors note that the extinction (and visibility) depends on scattering and absorption by aerosol particles. But the extinction coefficient (and visibility) depends on molecular scattering and gas absorption as well.
3. The statement that the Koschmieder method is based on scattering of light by a black object (p.11259) is incorrect. A black object does not scatter light at all.
4. Pp.11259 - 11260. The Koschmieder method was developed for observation along a horizontal track, the length of which can be considered infinite. It is why the theoretical basis for the GOES-R ABI visibility algorithm is Equation (1b) and not Equation (3), where is AOD of a vertical layer. It should be clearly formulated that the transition from the formula (1b) to (3) is made only in order to determine in the surface layer assuming that the extinction coefficient is a constant over the thickness (x).
5. What is the difference between at the p.11264 and at p.11259? Just is it that is measured in inverse mega-meters? But the value of can also be measured in the same units.

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 11255, 2015.

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