

## 2011 Observations of Stratospheric Aerosol over Hampton, VA related to the Nabro volcanic Eruption in Africa

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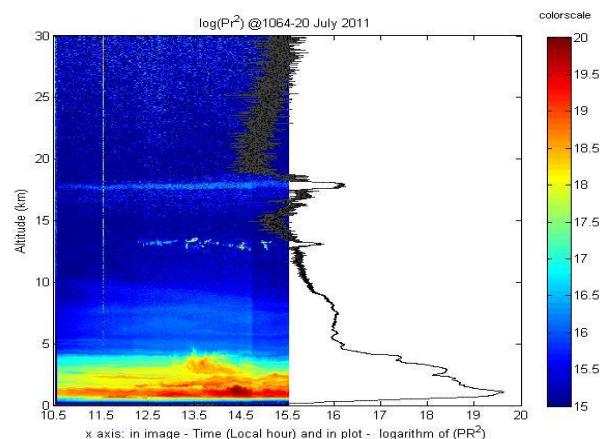
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Lidar observations from Hampton University, Hampton, VA (37.02°N, 76.33°W) show several stratospheric aerosol layers between 15.3 and 18.8 km altitude beginning 14 July 2011 and continuing throughout August, September and October. These layers are shown to be due to the June 2011 Nabro volcanic eruption, Africa (13.37° N and 41.70° E). A trajectory analysis was conducted using HYSPLIT to investigate the air mass history of the stratospheric layer and determine its source. Backtrajectories from observations made on 20 July clearly show the transport of stratospheric aerosol layers between 16 km and 18 km from Africa to Hampton. A nighttime CALIPSO overpass on 21 July, 327 km from Hampton, confirms a stratospheric layer at approximately the same height. The backscatter and extinction coefficients of these stratospheric aerosols are reported using the Klett method and an estimated lidar ratio.

Three 20-day back trajectories were computed starting from 17.80, 17.83, and 17.86 km above mean sea level directly over Hampton University's observatory (37.02°N, 76.33°W) on 20 July 2011 at 1500 UTC. The distance between the HYSPLIT backtrajectories and same-day coincident CALIPSO overpasses is calculated. The closest CALIPSO overpasses to the backtrajectories are used to confirm the presence of stratospheric aerosols related to the Nabro eruption.

In figure 1 we present the range-corrected elastic backscatter signal on 20 July 2011, the day of the strongest observed range-corrected signal of stratospheric aerosol over Hampton. The lidar measurement starts at 10:30 and continues until 15:30 local time. An increase in the 1064 nm range-corrected backscatter signal was observed in the stratosphere between 17.3 and 18.3 km (Figure 1) with a peak signal observed at 17.8 km. For contrast, a cloud layer has also been observed between 12.7 km and 13.6 km from approximately 12:45 local time onward.



**Figure 1** The range-corrected elastic backscatter signal measured on 20 July 2011 between 10:30 and 15:30 local time. The black line is the average of range-corrected signals between 14:00 and 15:00. The color scale is the Logarithm of PR<sup>2</sup> in the image.

Multiple observations over different days show stratospheric aerosols in July, August, September and October, all of which appear to be related to aerosol produced by the Nabro eruption aerosol layer, corroborating the long life of these aerosols, the CALIOP lidar measurement aboard CALIPSO, and the HYSPLIT model of aerosol transport in the lower stratosphere.

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