Geophysical Research Abstracts
Vol. 20, EGU2018-15117-4, 2018
EGU General Assembly 2018

Reconstructing the pseudo-continuum spectrum of FeO and determining the influence of NiO

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From the ablation of meteors the region of the MLT is enriched by metals such as Na, Fe or Ni. While a two stage reaction of Na with ozone results in a emission doublet at $0.592\mu m$, Fe and Ni form metal oxides which emit a pseudo-continuum. This pseudo-continuum emission is a broad but weak emission and hence is difficult to observe. The pseudo-continuum of FeO is located in the wavelength range of 0.55 to $0.72\mu m$, while NiO covers 0.45 to $0.72\mu m$.

For the study of the faint pseudo-continuum of FeO and NiO, we used astronomical facilities. The first data set consists of data taken by the Very Large Telescope (VLT) operated by the European Southern Observatory (ESO) in Chile (24°37′S, 70°24′) while the second set was taken at the Apache Point Observatory (APO) in New Mexico/USA (32°46′N, 105°49′W). The ESO spectrograph X-shooter (0.30 - $2.48\mu m$, resolving power R = 3000 - 18000) as well as the APO MaNGA survey instrument (0.36 - $1.03\mu m$, R$\sim$2000) cover the wavelength range with the FeO and NiO emission. The X-shooter sample consists of 3662 spectra taken between October 2009 to March 2013. A sub-sample of 223 spectra was created from the total sample. The MaNGA sample consists of of about 1500 spectra taken between February 2014 and June 2015.

An X-shooter spectrum is divided into three arms: UVB (0.40 - $0.56\mu m$), VIS (0.55 – $1.02\mu m$) and NIR (1.02 – $2.48\mu m$). In the same spectral region as the FeO, there are also significant emissions from NiO and NO+O. These emissions are covered by the VIS arm. Using the laboratory spectra of NiO by Burgard et al. (2006) and the NO+O continuum according to Khomich et al. (2008), it is possible to reconstruct the FeO spectrum from this superposition. Furthermore, an estimate of the NiO contamination within the FeO spectrum is possible. While Evans et al. (2008) find a ratio of NiO/FeO of 5-3% and in case of the OSIRIS data even 230% our study indicates an average contribution of 2%. The maximum contamination found was 43%.

To improve this study the MaNGA data set could provide us with further clues. MaNGA covers its wavelength range with two different spectrographs. The blue part of the spectrum (0.36 – $0.63\mu m$) comprises the most prominent feature of the FeO and NiO emission.This study would allow to distinguish the NiO from the FeO spectrum and study both species independently. However, the data set has to be corrected for the light pollution of nearby cities. This will be the most crucial step in the data reduction before any conclusions on the metal pseudo-contiua can be made.