Specific data correction for EnMAP and DESIS

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The processing chains of the upcoming hyperspectral missions DESIS (DLR Earth Sensing Imaging Spectrometer), and EnMAP (Environmental Mapping and Analysis Program) must deal with different systematic effects which influence the quality of the data. This work will present the most relevant effects and the correction and attenuation procedures that will be implemented.

A common defect of digital imaging systems is the existence of abnormal pixels. These defective pixels can appear during and after the fabrication process. Defective pixels enter the processing chain in early stages and their influence can spread to latter stages if not corrected. Due to the different architectures of the processing chains the effect is handled differently in DESIS and EnMAP. The EnMAP strategy for abnormal pixel is based on linear interpolations of the BOA (Bottom Of Atmosphere) reflectances in the spectral direction. In the case of DESIS, a hybrid interpolation method for abnormal pixels is used. The algorithm selects the optimum value between spectral and spatial cubic spline interpolations of the TOA (Top Of Atmosphere) radiances. The selection criterion is based on the spectral gradient difference between the interpolated pixels and spatial neighbors.

Another effect in both sensors is the so called *smile effect*, affecting push-broom hyperspectral sensors by shifting the central wavelength in the across-track direction. This spectral distortion is minimal in the center of the sensor, increasing towards the sensor edges in the across-track direction. The smile effect is particularly noticeable on hyperspectral sensors as the band width is in the order of a few nanometers. In this case, EnMAP performs a column-wise smile-aware atmospheric correction, taking the shifted wavelengths into account and interpolating the BOA reflectances to the sensor's nominal wavelengths. On the other hand, DESIS addresses the smile correction interpolating TOA radiances.

Finally this work will present a DESIS specific effect due to the choice of rolling shutter mode for the data acquisition. The advantages of this mode are a higher frame rate and a better SNR (Signal to Noise Ratio) than the global shutter mode. However, as a side effect, every individual band is acquired at slightly different time, and therefore, at slightly different position on the ground. To compensate for this effect, the band number and their integration times are used to calculate, via a cubic spline interpolation, new points in the along-track direction for all wavelengths.