



Blind source separation for remote sensing hyperspectral data

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Introduction Recent hyperspectral dataset, such as the visible and near infra-red imaging spectrometer OMEGA onboard Mars Express (ESA), are very large. For OMEGA [1], the dataset represents more than 5000 observations and each typical observation has 100000 spectra. Unsupervised selection and extraction of characteristic spectra from a given observation is required to analyse such huge dataset. Standard techniques using decorrelation (ACP) or independence (ACI) are not relevant to estimate surface reflectance spectra and abundances [2]. In addition to independence, the positivity constraint seems to be more accurate.

Method This search-algorithm method, written in bayesian formalism, provides statistical analysis without information about the observation except that: all observed spectra are linear combinations of certain spectral sources; the spectra are positive; the abundances are positive; the distributions of the chemical compounds at the surface of Mars are spatially/spectrally independent. This study demonstrates how this tool correctly detects both CO₂ and water ice [3].

Reference [1] Bibring, J. et al, ESA SP-1240: Mars Express: the Scientific Payload, 2004, 37-49 [2] Nascimento, J. Dias., IEEE TGRS, 2005, 43, 175-187 [3] Moussaoui, S. et al., accepted in Advances Blind Signal Processing.