A new concept of hyperspectral instrument is presented. Novel design of hyperspectral skydome allows retrieval of atmospheric constituents and properties from a snapshot of spectral solar radiation over entire sky, regardless of platform motion either on ground or aircraft. Design and description of subsystems of the instrument are given followed by preliminary tolerance analyses, whose results are to be used in the sensor design along with hardware specifications. Extended application of the hyperspectral skydome is being carried out in the gap in the atmosphere between 0(degrees) and 360(degrees) (Choi and Milton, 2006). Such technique on airborne platform yields unique capability, the key to improvements in radiative transfer models and retrieval algorithms (e.g. Kluzeck et al., 2010). Novel design of airborne hyperspectral skydome is introduced as a replacement of spectrometer with extended geometric flexibility. Many operational issues from continuous day and night observations as well as from a variety of sky conditions are addressed as well as from the sensor altitude. Downwelling irradiance synchronised with airborne IS, e.g. ARM P3 (2003) successfully demonstrated that such indirect derivation of AOD (Aerosol Optical Depth) is considered as an important spectral signature of atmospheric constitutes (Hueglin et al., 2006). When the Sun light enters Earth’s atmosphere, scattering and absorption interfere with each other. The observed signal is therefore the result of countless interaction with atmosphere (equation 1). When the Sun light enters Earth’s atmosphere, scattering and absorption interfere with each other. The observed signal is therefore the result of countless interaction with atmosphere (equation 1).

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E_{\text{total}} = E_{\text{dir}} + E_{\text{diff}}
\]

In other words, total solar irradiance is sum of direct and diffuse components (Figure 3).

Since the hyperspectral skydome spectrometer takes direct measurements of total irradiance \(E_{\text{total}}\) and diffuse irradiance \(E_{\text{diff}}\) by integral of NAP readings (Equation 1), novel design of solar radiometer is essential to assure accurate measurements of the solar diameter, Advances in Space Research, 35, 329-340.


