Thermal Airborne Spectrographic Imager for Temperature and Emissivity Retrieval

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The Thermal Airborne Spectrographic Imager 600 (TASI-600) is a hyperspectral infrared sensor manufactured by the Canadian company ITRES© [1] which started being operated by the Institut Cartogràfic de Catalunya (ICC) at the end of 2009. The system works in a pushbroom configuration and provides the user with 32-band hyperspectral data in the 8-11.5µm spectral range. The nominal Field-Of-View (FOV) is 40º and spreads over 600 spatial pixels. The TASI adds to the visible and near-infrared (VNIR) Compact Airborne Spectrographic Imager (CASI) system regularly flown by the ICC since 1993 [2][3], and gives the opportunity to measure and retrieve information concerning skin-temperature and emissivity spectrum of the imaged scene.

In this paper, the preliminary results in terms of temperature and emissivity retrieval from TASI data will be presented. First, a brief overview of the sensor's acquisition geometry and raw data processing chain will be given. Then, the problem of atmosphere contributions to hyperspectral radiance information will be addressed and coped with using the In-Scene Atmosphere Compensation (ISAC) technique [4]. The reliability of ISAC will be studied using TASI data that will be acquired in the frame of a field experiment planned for spring/summer 2010 in collaboration with the Universitat de València Estudi General (UVEG). Hyperspectral transmissivity and upwelling radiance retrieved by ISAC will be matched to a MODTRAN-based Look-Up-Table (LUT) containing 4-year atmosphere cases of the city of Barcelona (2006-2009) provided by the Servei Meteorològic de Catalunya (SMC) [5]. In-situ radio-sounding measurements are also planned for the assessment of the results. Afterwards, the separation of temperature and emissivity information from land-leaving hyperspectral radiance will be tackled. The ARTEMISS technique described in [6] will be applied to pixels representative of different types of areas such as natural surfaces and urban environments. Temperature estimations will be compared to in-situ measurements, whereas retrieved emissivity profiles will be matched to a TASI spectral database obtained from the Aster Library [7]. Finally, the potentials of TASI for specific applications based on hyperspectral TIR data will be stressed.

Keywords: **TASI, hyperspectral emissivity, thermal atmospheric correction, ISAC, ARTEMISS.**
Presentation preference: **Oral.**

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