



A Comprehensive and Modular UAS for Earth Observations

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Unmanned Aircraft Systems (UAS) are increasingly popular platforms for a wide range of Earth observation applications. The current challenge is to create a system that is easy to adapt to specific applications and simple to operate, demands a minimal infrastructure for deployment, has a reliable performance, and is affordable. We present a modular three-tier system that comes close to an optimal solution.

The first tier consists of a 66g, credit-card sized autopilot that features full 9 degrees-of-freedom IMU, air pressure sensor, and GPS receiver. This is a stable system which already controlled hundreds of flights of aircrafts with takeoff-weights ranging from 1.5 to 40 kg operated in Europe, Africa and South-America. The second tier is the Sirius II platform, a hand launched/belly landed 2 meter wing span airplane that carries a 0.8 kg payload for 1 h.

The third tier is formed by the ground station with the flight planning and control software. It allows to define a three-dimensional flight path by anything from a simple list of waypoints to elaborate sequences of flight path operators, monitors the aircraft in realtime, and allows everything from in-flight modifications of the flight pattern to manual intervention.

Our UAS is capable of automatic takeoff, flight and landing. Its operation can be learned in a few hours and does not require any experience as a model aircraft pilot. Everything fits into a hiking backpack for easy transportation and preparations for a flight are minimal. This facilitates a flexible use at the time and place needed and allows the scientist to focus on her experiments and measurements. As applications, we demonstrate the acquisition of a high-resolution DEM and simple measurements of the spatial structure of soil surface temperature.