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0.0.1 Derivation of land use / land cover and surface temperature in a high spatial resolution with a remote controlled ultra light air vehicle

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For a better understanding of hydrological processes, like evapotranspiration, it is necessary to close the temporal and spatial gap between point measurements, which provide information in a very high temporal resolution and satellite images which cover big areas. The remote controlled UAV is a tool which can bridge that gap.

It consists of a special light weight steel frame with a 5.5 hps strong 2-stroke engine and special type of parachute which serves as a wing. This allows a slow and stable flight and guarantees as well high safety in case of a failure of the motor. The desired sensors can be attached on a gimbal mounting. The overall weight of the UVA is between 8 kg and 12 kg. Up to six kilogram payload can be carried. The maximum flight speed is up to 30 km/h. Flight time is more than 60 minutes, and the of the remote control is between 1.5 km and 8 km dependent on the legal regulations of the country. The UAV can be operated up to 6 m/s wind speed and needs a runway of about 25 m length. The big advantage is that it is very easy to fly and to land so that everyone can learn to operate it within 1-2 days.

The land use and land cover can be mapped with a calibrated high end digital consumer camera in the desired spatial resolution, which is a function of the flight height and the used camera lenses. As well a special designed multi-spectral camera with a near infrared channel can be mounted at the same time. The multi-spectral images provide information about the vitality of the vegetation.

To get spatial information about the surface temperature, which is an important parameter to calculate evapotranspiration, a thermal camera can be mounted additional to the optical camera. With these set up it is possible to measure the surface temperature in the desired spatial resolution (which is dependent on the flight hight) and the necessary temporal resolution (e.g. every hour or every 15 minutes).

On board of the UAV a GPS with a radio link is mounted which transfers the position and important flight parameters in real time to a ground station. As well the IFV of the camera is transmitted in real time to the ground so that the operator can see it in special glasses or on a laptop screen. The images can be taken via remote control by the operator.

The processing of the images can be performed with standard image processing programs like ERDAS, ENVI – IDL. As well low cost solutions exist.

The remote controlled UAV proofed to be a suitable tool for process monitoring, calibration and validation of models.