Earth Observation Sites in The Netherlands

The ITC faculty of University of Twente maintains a number of earth observation sites to support research and education. These earth observation sites are part of a global network: the 'Global Earth Observation System of Systems' (GEOSS).

These sites are part of our effort to guarantee ITC's successful and sustained contribution to GEOSS and contribute to two competences:

- conduct fundamental research using both space-based and in situ sensors to further relevant ITC expertise and application areas meeting GEOSS needs (e.g. disasters, water cycle, climate change, ecosystems, agriculture and biodiversity, relevant to ITC's expertise). offer advanced earth observation

Enschede

Purpose of observation:

The weather and climate in cities is of high importance for the wellbeing of its citizens, for its liveability, as well as for the environmental quality. This climate is governed by the energy and water balance and determined by the relative contribution of their different components. Since 2017 we measure and monitor these components, like for example water consumption, heat and CO2 production and solar radiation among others, over Enschede and combine this information with remotely sensed observations from

satellites, airplanes and drones.

This helps us to not only map the urban climate on the long term, but also yields information on the so-called Urban Heat Island effect (i.e. how much warmer is it in the city and its neighborhoods as compared to its surrounding?) and for example on local air-circulation patterns. This information can then be used for mitigation and/or adaptation measures that touch upon a suite of different aspects such as health (sleeping quality, air quality, mortality), public space (pressure on parks, drought damage to flora and



Participation in (inter)national programme/campaigns:

• Hyperscout (Hyperspectral cubesat) CAL/ VAL air- and space-born campaign 2019.





courses as requested in the GEOSS social benefit areas.

The general goals of the earth observation sites and related education and research activities are to strengthen the capability of our students and staff, to:

- use earth observation data and products (i.e. process, integrate, model, etc.) in a sustainable, repeatable manner (both space-based and in situ sensors), with results or outputs that are consistent with accepted earth observing standards.
- contribute in situ observations to global networks, and access and retrieve relevant data from global data systems useful for in situ applications.
- analyse and interpret data (both in situ and space-based) to derive nationally, regionally and globally relevant information and provide decisionsupport systems and tools useful to decision-makers.
- integrate earth observation data and information with data and information from other sources for a comprehensive and holistic view and understanding of problems in order to identify sustainable solutions.

Locations

We are currently involved in seven collaborative sites on three continents, of which two are located in The Netherlands; one over a natural forested area (Speulderbos) and another over an urban area (Enschede).

Fig 1. Turbulent flux and radiation measurements on the rooftop of the IIH of UT, downtown Enschede

Fig 4. Heat (red) and watervapor (blue) emission as measured downtown Enschede during the 2nd, 3rd and 4th of July 2018 Fig 3. Modelled maximum night temperature difference between Twente airport and downtown Enschede. The displayed range is from 0 (blue) to 8 (red) degrees Celsius for the 3rd of July 2018

Speulderbos

Purpose of observation:

The purpose of the Speulderbos research site is to provide a long-term monitoring of key state variables of forest physiology, soil physics and chemistry, hydrology and atmosphere. These data are used at ITC to develop remote sensing measurement techniques. The site was established in

1985 and has since resulted in discoveries about: rain chemistry (acid rain), deposition, nitrogen and carbon budget of forest, rainfall interception and soil micro-biology, microwave remote sensing in forests, and the advance of isotope discrimination methods in hydrology. Since 2019, the site is used in as the key

fieldwork site in the education program of the WRS department of the ITC faculty.

Participation in (inter)national programme/campaigns:

- NitroEurope: large EU project lead by ECN (http://www.nitroeurope.eu/)
- EAGLE-2006 Campaign funded by ESA.







Fig 6. Permanent scientific instruments consist among others of an eddy covariance system



Location map.

Fig 5. A solid 46 m tall scaffold is equipped with an elevator and platforms at every 4 m.

to measure heat, CO2 and water exchange; accurate four component radiometers; profiles of irradiance, temperature and humidity.



Fig 7. Apart from throughfall on the forest floor and needle wetness, soil temperature, soil moisture and soil heat profiles are measured below the surface as well.

Fig 8. Selection of data of 10 April 2019, showing the CO2 flux, the radiation budget and the energy fluxes.

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