HYPER-SWISS-NET: Fostering the Swiss Research Community in the Field of Imaging Spectroscopy

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Scientific Background

The field of imaging spectroscopy has reached in terms of knowhow and technology a high **level of maturity**, which makes its observations accessible and useful for a larger research and user community.
The Hyper-Swiss-Net will develop a range of **Earth observation (EO) applications** drawing from the scientific expertise of the project consortium as well as considering the requirements of the respective user community.
The implementation of the different EO products will be based on dedicated flight experiments with the airborne **imaging spectrometer APEX** [1] and will directly build on the operational capabilities of the APEX processing and archiving facility (PAF) [2].

Sensor: Imaging spectrometer APEX

Table 1: APEX specifications

Spectral range	VNIR: 380-970 nm SWIR: 940-2500 nm
Spectral bands	programmable binning patterns (max. 534 bands)
Spectral resolution (FWHM standard binning)	VNIR: 3-18 nm (0.44-6.3 nm, un-binned) SWIR: 7-11 nm
Spectral sampling	0.5 - 11 nm
FOV / IFOV	28° / 0.028°(0.5 mrad)
Swath / pixel size (@ 3.5 km AGL)	1.7 km / 1.7 m (across), 3.4 m (along)
Environmental conditions	Ambient temperature, Pressurized OSU
Calibration	In-Flight Characterization

apex Airborne PRISM Experiment — esa

Figure 1: First APEX flight October 2008 (geocoded data)

EO Products and Project Consortium

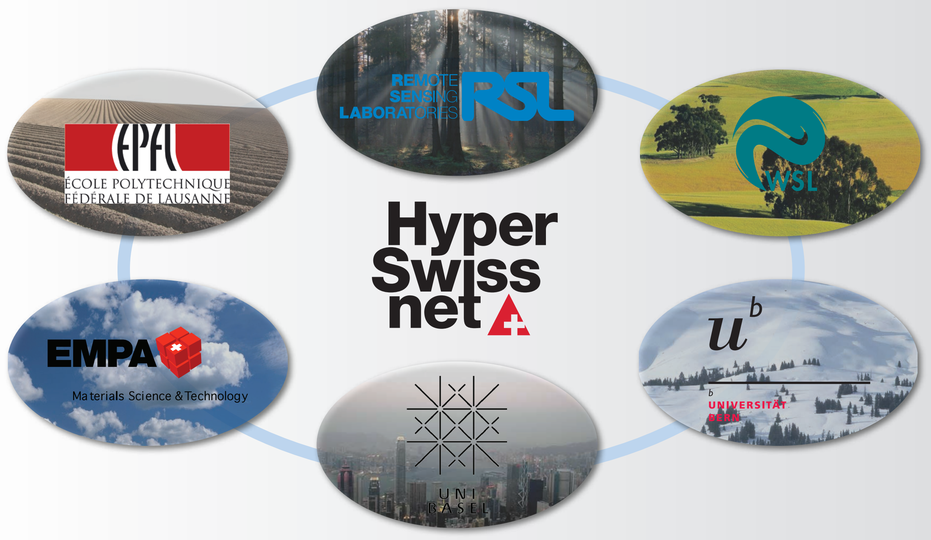

Figure 2: The Hyper-Swiss-Net consortium and their respective expertise

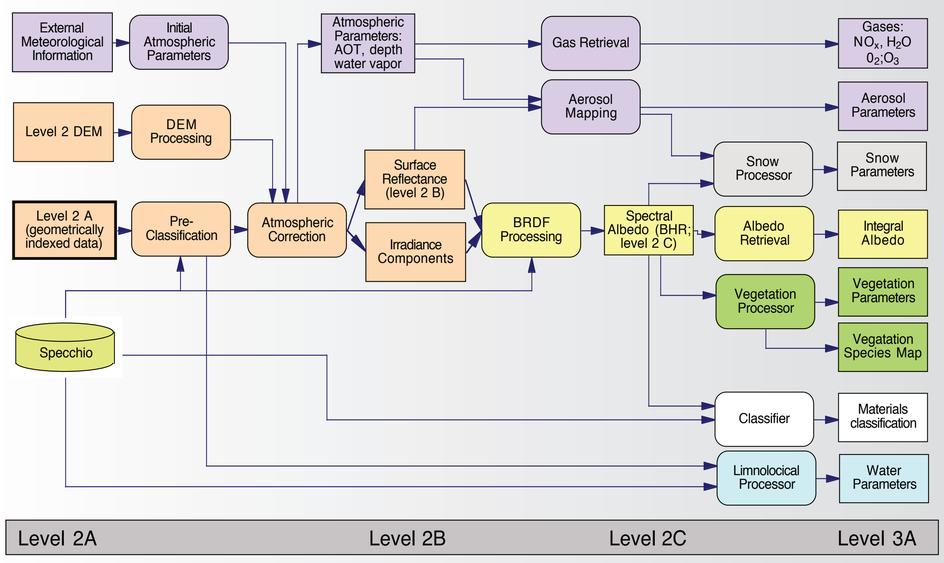

Figure 3: The APEX Processing and Archiving Facility (PAF)

Table 2: Planed Hyper-Swiss-Net EO products and their scientific objectives

EO Product	Responsible partner	Objectives
Urban climatology	Institute for Meteorology, Climatology and Remote Sensing (MCR), University of Basel	Assessment of specific fluxes in the radiation and energy balance over
Snow and Climate	Remote Research Sensing Group, University of Bern (GIUB)	Detection of snow properties (snow grain size, impurities) in the Alpine Region.
Vegetation dynamics	Remote Sensing Laboratories (RSL), University of Zürich	Monitoring status and extent of terrestrial ecosystems for understanding ecosystem functions and biodiversity.
Atmospheric trace gases	Laboratory for Air Pollution and Environmental Technology, Empa	Spatial assessment of key air pollutants (e.g. NO2) to obtain detailed information on individual emission sources.
Synergy IS & SAR	Space Center EPFL, EPFL Lausanne	Retrieval of bio- and geo-physical parameters from the synergy of imaging spectrometry (IS) and Synthetic Aperture Radar (SAR).
Land use dynamic	Land Use Dynamics Unit, Swiss Federal Research Institute WSL	Monitoring of canopy biochemistry for different habitat types for parameterization of biogeochemistry modeling experiments.

Work Breakdown and Schedule

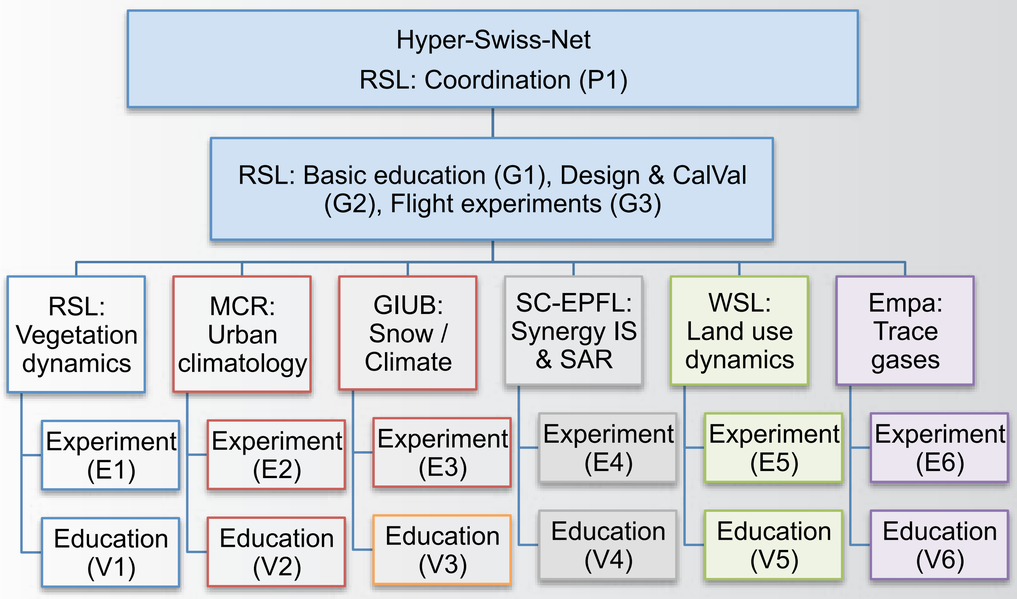

Figure 4: The Hyper-Swiss-Net work breakdown

Table 3: The Hyper-Swiss-Net time schedule and milestones

Scientific Design	4th Quarter 2008
Basic IS Education Module	3-4th Quarter 2008
Technical Specification	2nd Quarter 2009
Data acquisition	2009-11
Algorithm Development	4th Quarter 2010
Teaching modules implementation	Fall 2011
Final EO Products	4th Quarter 2011

Project Duration: 3.5 years

Updates: https://hyperswissnet.wiki.geo.uzh.ch/Project

References

[1] Itten, K., Dell'endice, F., Hueni, A., Kneubühler, M., Schläpfer, D., Odermatt, D., Seidel, F., Huber, S., Schopfer, J., Kellenberger, T., Bühler, Y., D'odorico, P., Nieke, J., Alberti, E. & Meuleman, K. (2008) APEX - the Hyperspectral ESA Airborne Prism Experiment. Sensors, 8, 6235-6259.
[2] Hueni, A., Biesemans, J., Meuleman, K., Dell'endice, F., Schlapfer, D., Odermatt, D., Kneubuehler, M., Adriaensen, S., Kempenaers, S., Nieke, J. & Itten, K. I. (2009) Structure, Components, and Interfaces of the Airborne Prism Experiment (APEX) Processing and Archiving Facility. IEEE Transactions on Geoscience and Remote Sensing, , 47, 29-43.

Hyper-Swiss-Net is jointly funded by the Swiss University Conference and the ETH Board as an Innovation / Cooperation project

REMOTE SENSING LABORATORIES RSL — UNI BASEL — UNIVERSITÄT BERN — Hyper Swiss net — EMPA Materials Science & Technology — Space Center EPFL — ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE — WSL