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European network infrastructures of observatories for terrestrial Global Change research

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The earth's climate is significantly changing (e.g. IPCC, 2007) and thus directly affecting the terrestrial systems. The number and intensity hydrological extremes, such as floods and droughts, are continually increasing, resulting in major economical and social impacts. Furthermore, the land cover in Europe has been modified fundamentally by conversions for agriculture, forest and for other purposes such as industrialisation and urbanisation. Additionally, water resources are more than ever used for human development, especially as a key resource for agricultural and industrial activities.

As a special case, the mountains of the world are of significant importance in terms of water resources supply, biodiversity, economy, agriculture, traffic and recreation but particularly vulnerable to environmental change. The Alps are unique because of the pronounced small scale variability they contain, the high population density they support and their central position in Europe. The Alps build a single coherent physical and natural environment, artificially cut by national borders.

The scientific community and governmental bodies have responded to these environmental changes by performing dedicated experiments and by establishing environmental research networks to monitor, analyse and predict the impact of Global Change on different terrestrial systems of the Earths' environment. Several European network infrastructures for terrestrial Global Change research are presently immerging or upgrading, such as ICOS, ANAEE, LifeWatch or LTER-Europe.

However, the strongest existing networks are still operating on a regional or national level and the historical growth of such networks resulted in a very heterogeneous landscape of observation networks. We propose therefore the establishment of two complementary networks:

The NetwOrk of Hydrological observAtories, NOHA. NOHA aims to promote the sustainable management of water resources in Europe, to support the prediction of hydrological system changes, and to develop and implement tools and technologies for monitoring, prevention and mitigation of environmental risks and pressures. In addition, NOHA will provide long-term statistical series of hydrological state variables and fluxes for the analysis and prognosis of Global Change consequences using integrated model systems. These data will support the development and establishment of efficient prevention, mitigation and adaptation strategies (E.g. EU-Water Framework Directive) and spur the development and validation of hydrological theories and models.

The second network, ALPS, – the Alpine Observing System – will create an unique infrastructure for environmental and climate research and observation for the whole Alpine region, providing a common platform for the benefit of the society in Europe as a whole. The initiative will build on existing infrastructure in the participating countries and on new and emerging technology, allowing an unprecedented coverage of observation systems at affordable cost. ALPS will create a new collaboration between scientists, engineers, monitoring agencies, public and decision makers, with the aim to gain an integrated understanding of complex environmental systems. The ALPS effort will be structured along three major axes: (i) harmonize and strengthen the backbone of permanent measurement infrastructures and complement these with dense deployments of intelligent networks, to improve the recording of environmental parameters overcoming disciplinary and national borders, (ii) link the main data centres to create a distributed cyber-infrastructure with the final aim to enable effective data access and retrieval to all science and society users, and (iii) invest in data assimilation and exploitation toward scientific and practical results in particular with respect to dealing with extreme events and natural hazards.

In this presentation, we will focus on the motivation, the concept and the scientific and organizational challenges of ALPS and NOHA.