

Suggested Theme for the 2012 GIFT workshop , Preliminary draft

Water!

The water cycle, also known as the hydrologic cycle, describes the continuous movement of water on, above and below the surface of the Earth. It also involves the exchange of heat energy, which leads to temperature changes. The water cycle figures significantly in the maintenance of life, society and ecosystems on Earth. However, several problems threaten water resources today, which are related to the unsustainable overexploitation of water resources, the lack of adequate water supply systems in many parts of the world, pollution, and an increase in the population at risk to water hazards. Such problems are caused by an ever increasing population, consumerism, urbanization and agricultural expansion.

In addition, as the water cycle involves heat exchange, it has a two ways feedback with climate as well. In particular, the effects of global warming of the atmosphere on the water cycle are significant. Observed warming over several decades has been linked to changes in the large-scale hydrological cycle such as:

- increasing atmospheric water vapor content;
- changing precipitation patterns, intensity and extremes;
- reduced snow cover and widespread melting of ice;
- and changes in soil moisture and runoff.

as a consequence, water resources have already been deeply affected by global warming: sea levels have risen, glaciers have retreated. Sometimes water reservoirs are essential to the life in entire regions. In addition, the hydrological cycle is heavily affected by land use change which induces relevant variations of groundwater recharge. The above problems cause concerns in almost every sector of everyday life, and geo-engineers are seeking ways of mitigation. All water bodies are going to be affected by global warming, making knowledge of the water cycle essential for any kind of human activity. Entire regions on Earth would face extreme temperatures eventually associated with torrential rainfalls other regions would experience scarcity of water and droughts.

In the GIFT workshop **“Water!”** all the different aspects of the water cycle will be described and discussed. Talks will focus on global freshwater availability and distribution, overexploitation of water, strategies for sustainable use of water in the future and the threats by environmental change, with examples of particular regions where global warming will have a major impact, such as the regions depending on the water supply from the Himalayan, Alpine and Andes mountain glaciers. The use of naturally occurring isotopes to "fingerprint" sources of water in precipitation and rivers, and the presence of hundreds of thousands of years old water underneath the deserts and other areas, will also be discussed..

Focus will also be put on climate model simulations for the 21st century, mitigation measures to reduce the magnitude of impacts of global warming on water resources, and water resources management and its impacts on other policy areas.