„Snowfall and rain response to current climate change and atmospheric circulation in Europe"

DESCRIPTION FOR THE GENERAL PUBLIC

Precipitation is crucial element of the Earth system, responsible for many environmental processes and conditioning the human life. Precipitation can occur in solid, liquid and mixed phase that is in the form of snowfall, rain and sleet. Precipitation phase significantly depends on air temperature, which is currently increasing. According to recent Report of Intergovernmental Panel on Climate Change AR5 (IPCC 2013) there annual air temperature raised by 0.85 °C over the period 1880-2010. Clear changes in the occurrence of particular precipitation phases are a repercussion of the warming. Such reaction has already been documented in the North America and Eurasia (mainly China). The impact of current climate change on the occurrence of snowfall and rain has not been studied in the Europe as a whole. Research has been performed in regional scales (the Alps) or for single locations (Cracow). Therefore, determination of snowfall and rain response to current climate change is necessary.

This project recognises variability and trends in the occurrence of snowfall, sleet and rain, their response to climate change and relation with atmospheric circulation in the entire Europe with particular focus on Central Europe.

The results of this project will enable us to answer the following questions:

1. What are the changes in the probability of snowfall and rain occurrence in the course of a year in different parts of Europe?
2. Are the long-term changes in the occurrence and totals of snowfall, rain and sleet statistically significant in Central Europe?
3. Is it possible to distinguish circulation types favourable and unfavourable for the occurrence of snowfall, rain and sleet in Europe? Does atmospheric circulation influence the long-term changes in the frequency of snowfall, rain and sleet?
4. What is an effect of global warming on the frequency and totals of snowfall, rain and sleet in Europe?
5. Which factor – air temperature or atmospheric circulation – more influences the long-term variability in the occurrence of snowfall, rain and sleet.

Quantitative information on precipitation phase is necessary for hydrology, particular for modelling purposes. Snowfall is essential source for irrigation and drinking water in many regions of the world. On global average, more than one third of irrigation water in the world is from snowmelt. Changes in the frequency and totals of snowfall decide on snow cover development, indirectly influence the radiation budget (change in albedo) and finally decide on the amount of energy captured in the Earth System. Snowfall also influence the probability of snowmelt floods and possibility for winter sports.