**Dynamics of snow density during snow accumulation and melting processes**

In order to characterize daily dynamics of snow cover accumulation and melting in different climates, the Canadian data for 1990-2010 are analyzed and modeled. Two continental (Estevan and Toronto) and three coastal (Vancouver\*, Eureka and Sydney) stations are studied. Both precipitation and snow cover are considered with their traces, which values are estimated using the Harmonized Frequency Analysis (HFA). Dynamics of daily new and aging snow density along with the snow depth are considered as controlling factors of entire process of snow cover formation and melting. Both the new and aging snow density rates as well as the sublimation rate in dependence of temperature, precipitation, wind and humidity are accepted to be the same for the entire cold period. Melting process has different parameters for spring and fall time, within and outside positive and negative intervals of the average daily amplitude of temperature.

We find that the models for Estevan and Eureka demonstrate good approximation (R = 0.93 and 0.89, respectively) and very similar sets of parameters: average sublimation approximately equals to traces of precipitation; very slow dynamics of the aging snow density also depends on the rate of sublimation. For Toronto (R = 0.87) the dynamics of density are much faster and depends significantly on precipitation. Vancouver\* and Sydney are the most complicated cases, where humidity affects density of both types of snow (newly fallen and aging one) in both accumulation and melting processes. In these coastal areas it is necessary to consider different parameters for the beginning and the end of snow pack formation following the seasonal changes of humidity. The speed of the processes suggests the hourly consideration of them in order to get significantly good result.

\*Vancouver was later replaced by Terrace, but conclusions are the same