Numerical modelling of hydrological processes is nowadays a very important sector of hydrology and water management, especially because of a huge progress of information and computer technologies. The characteristics of precipitation are the ones of the main data inputs to hydrological models. This thesis is the part of the research engaged in Krušné Mountains by the Department of Physical Geography and Geoecology. Some results were also included to the Czech-German project of flood control in Krušné Mountains INTERREG IIIA called DINGHO.

The aim of this thesis is to give some basic information about a range of methods and approaches to rainfall-runoff modelling. The modelling system HEC-HMS has been chosen for the simulations of a few hydrological events in the upper Chomutovka river basin. These events differ in the type of rainfall and the magnitude of peak discharge. Several different methods for calculating the mean aerial precipitation like Thiessen polygons, Inverse Distance Weighted Scheme, Ordinary Kriging or Topo to Raster as well as the quantitative precipitation estimation based on radar measurements have been applied and tested during these simulations. The mean aerial precipitation has been calculated for hourly time scale. The aim has been to evaluate the influence of each method for characteristics of simulated hydrographs.

On the basis of the simulated hydrographs and computed characteristics of flood waves, we can see that different mean aerial precipitation calculation methods can have significant influence on modeled runoff. Chart curves don't differ too much, differences occur in the comparison of the magnitudes of the peaks and the volumes of runoff. Hydrographs simulated on the basis of different rain gage-only interpolation estimates of precipitation don't vary exceedingly for continuous rain. On the other hand it seems that quantitative precipitation estimation based on radar measurements underestimates this type of precipitation. On the contrary modelled hydrographs vary a lot in the case of convective storms. But there is the influence of size of convective cell and its position with respect to the rain gage network. Calibration of the used model is crucial for calculation of the quantitative differences in characteristics of simulated hydrograms.