This thesis deals with modelling and forecasting lightning activity using NWP model ALADIN. The first part briefly describes physical processes involved in lightning initiation and principles of lightning detection. This part also outlines some basic principles of modelling deep convection and phase changes in ALADIN and continues with description of diagnostic scheme for forecasting of lightning activity. The main part describes calibration of the scheme as well as compares forecast with measured data from lightning detection system LINET. Both time and spatial distributions are considered. This part also contains analysis of scheme behaviour during six days with significant lightning activity over Czechia.