About one quarter of the northern hemisphere is covered by permafrost. Permafrost areas inherit approximately 50% of the estimated global below-ground organic carbon pool. A destabilization due to the expected amplitude of future Arctic climate warming would lead to a global-scale feedback mechanism. This feedback comprises interactions between snow, permafrost, hydrology, and ecosystems, which include altered energy and water fluxes between atmosphere and land surface. The representation of permafrost related processes in GCMs and ESMs is still rudimentary and needs to be extended to improve the climate model performance in high latitudes. In this sense thermokarst processes should be included into JSBACH, the land-surface component of MPI-ESM, the Earth System Model of the Max-Planck Institute for Meteorology. Structural improvements and new parameterizations of the model are required with regard to heat and water flow (physical processes) and carbon and nitrogen dynamics (bio-geochemical processes). The implementation of a thermokarst module is one task within the EU project PAGE21 and is a joint activity between MPI-M Hamburg and MPI-BGC Jena. Thermokarst changes are coupled thermal-hydrological processes, which lead to an enhanced thawing of ice-rich permafrost and depletion of soil organic carbon on local-to-regional scales, where the soil structure is characterized by high amount of segregated ice and large ice-wedges. Thermokarst affected areas appear as a very uneven surface of hummocks and marshy hollows. The initial heat balance of the surface is disturbed by different trigger mechanisms, which cause the ground ice to melt and the soil to subside into depressions due to developing cavities in the interior. The depressions fill up with melting and precipitating water. Permafrost thawing is continued and depressions grow further due to soil subsidence and slope wash at the margins until a new soil surface heat balance is reached. Here I’d like to show results of the first simulation runs of the thermokarst process in the Arctic tundra. The main focus will be on investigating the distribution of thermokarst lakes within JSBACH, which has a resolution of about 1.875°. The grid cells are tessellated in Poisson-Voronoi Polygons. Depending on disturbed area fraction a part of them is affected by thermokarst. Depending on ice-content and slope, lakes of different size and depth are developed. From the variety in lake parameters a distribution function of thermokarst lakes is derived. The change of the distribution is modelled regarding to water and heat balance throughout several years. For each year, the disturbed area fraction is derived from several climate parameters like temperature, precipitation and snow depth. Since thermokarst mechanism is a small-scale process of 10-1000m in spatial extent, it needs to be parametrized on large ESM grid scale. In this sense the model implies a first approach to include thermokarst in ESM.