

## Europa: seismic geophysical researches

**O. B. Khavroshkin** (1) and V. V. Tsyplov (1)

(1) Schmidt Institute of Physics of the Earth, RAS Moscow, Russia (khavrosh@ifz.ru)

### Abstract

Under seismic geophysical processes (and - or researches of the last) on any heavenly body it is necessary to understand the block of physical fields and the processes accompanying passage through the geological environment of seismic waves. Analyzing in more details ice of Europa, Antarctic polar station (APS) as ground analogue of the seismic block of the landing device, geomorphology of Europa. In total it is known 11 versions of ice the majority of them is possible exists in a crust of Europa. It enables existence of phase borders of 2-nd sort and phase transition of explosive type. There is also a problem of sinking ice that means probability of existence composite corn with significant ice part which can show metal properties. On depths more than 1200 m it is necessary to expect occurrence some clathrate ice that also complicates a wave picture. Thus, the smooth external surface of a crust, its homogeneous structure and homogeneous pressure in a massif of ice do not relieve seismic researches of complex and interesting problems as to some extent ice of Europa contained or contains a dust component it makes it as well by the carrier seeds of life. One of key geophysical tasks at research of Europa is definition of parameters of an ice crust and thickness and capacities of it. The most perspective and authentic method is seismic. As own seismicity of Europa cannot be significant on capacity and frequency of events, and conditions of stay of landing station on a surface is rigid at reliable performance of seismic experiment two circumstances should be taken into account: insignificant duration of functioning of the equipment and rare weak seismic events. Really the picture can be more optimistically, as constantly there is an induced seismicity and seismic noise because of powerful tidal forces and influences of meteoroids and gas dust streams. As seismic noise of Europa is supposed significant that it allows to apply modulated method and to receive an independent estimation of capacity of a

crust. As there is an opportunity of check its on the data of Polar station (USA) in Antarctica where thickness of an ice cover is close to the minimal estimations of capacity of a crust of Europe. For this purpose seismograms have been analyzed of two removed earthquakes and records of seismic noise (microseism).

As result was roughly estimation the spectral components corresponding to thickness of the ice. Peaks of the same range of the periods are observed and without earthquakes on spectra of seismic noise in a range from 8 till 4 seconds.

### Conclusions

The received results allow to estimate roughly necessary time of registration of seismic signals for Europa, guaranteeing definition of capacity of an ice bark. At capacity in 5-10km necessary duration of record will make 1-3 hours; at 60-600km is 1-1.5 day.