

## The wind regime of the mesosphere and lower thermosphere during the DYANA campaign—II. Semi-diurnal tide

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**Abstract**—Co-ordinated ground-based radar measurements carried out during the 15 January–15 March 1990 DYANA campaign at 14 different geographical sites have provided a good opportunity to investigate the characteristics of semi-diurnal tidal variations in the mesosphere/lower thermosphere over a wide spectrum of space/time scales. It is pointed out that significant differences of monthly mean tidal parameters observed at the various sites may be explained by latitudinal and longitudinal effects.

Well-defined 2–3-week oscillations of the tidal parameters are found to be typical of all observational sites. Their estimated space scales do not contradict the hypothesis about a possible coupling between these oscillations and the low wave-number processes in the stratosphere. Tidal parameter oscillations with 2–5-day periods may be explained to be effects of the nonstationary processes with longitudinal wave numbers  $S > 3$ .

### 1. INTRODUCTION

Co-ordinated measurements of wind in the mesopause/lower thermosphere (*c.* 80–105 km) carried out at different geographical locations as part of the DYANA program provide a good opportunity to investigate characteristics of the semi-diurnal tidal (ST) variations over a wide spectrum of space/time scales.

Table 1 shows the measurement sites and some characteristics of the obtained data.

As follows from Table 1, the measurements were taken by three methods. The major part of data was obtained by the meteor radar method (MR). This method was applied at nine out of 14 sites. The spaced antenna method using medium-frequency radars (MF) was applied at three sites and, at the other two, the method of ionospheric drift measurements in the low-frequency range (LF) was used. It can also be seen from Table 1 that the majority of sites are located in the mid-latitude European region.

The experimental data on which the studies are based are amplitudes and phases of semi-diurnal oscil-

lations, obtained by the harmonic analysis of time series of mean hourly wind velocities measured during the DYANA campaign from 15 January to 15 March 1990. The techniques used by the different teams to measure and process the data differed significantly and efforts are made to unify the experimental data presented for joint analysis. However, the problem of the compatibility of the data needs to be discussed. The previous comparisons of results of measurements taken in the same or closely spaced sites using the techniques MR and LF (PORTNYAGIN *et al.*, 1978), MR and MF (PORTNYAGIN *et al.*, 1991), MF and FPI (MANSON *et al.*, 1991) help to solve the problem to a certain extent.

To assess how the methods of measurement and processing influence the parameters under consideration we will outline the methods and refer to the materials in which they are described in more detail.

The measurements in Obninsk, Volgograd and Khabarovsk were performed by the meteor radar method by sounding four regions in space with their centres at the height of 95 km and at a distance of 200 km from the radar. The scanning of the regions