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MESOPAUSE REGION SEMIDIURNAL TIDE OVER EUROPE AS SEEN FROM GROUND-BASED WIND MEASUREMENTS

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ABSTRACT

Wind measurements carried out at 6 European sites are investigated to set up a climatology of the semidiurnal tide in the mesopause region over Europe for the latitudinal range between 50°N and 56°N. Intercomparison of amplitudes and phases generally shows good agreement of the results from the different measuring systems. The longitudinal variation of the semidiurnal tide is small. The results are compared with an empirical model of the semidiurnal tide.

INTRODUCTION

The semidiurnal tide in the upper mesosphere/lower thermosphere region has been measured for several decades, so that its long-term interannual variability can now be studied, for instance with respect to long-term trends (Bremer at al., 1997). Seasonal and latitudinal variation of the semidiurnal tide has already been investigated empirically (Manson *et al.*, 1989; Lysenko *et al.*, 1992), and with the aid of model calculations (Forbes and Vial, 1989). More recently, climatological models have been developed using results from a large number of stations (Forbes *et al.*, 1994, Portnyagin and Solovjova, 1998). However, the global distribution of the measuring sites is erratic, and direct comparison of simultaneously measured tidal amplitudes and phases is still necessary to prove the global significance of single-point long-term measurements. Additionally, the suitability of the respective measurements for use in empirical models requires verification. Semidiurnal tides from six European sites in a small latitude band of 50° - 56°N are investigated to address the latter point.

DATABASE

In this study we use monthly mean winds measured by meteor radar, MF radar and low-frequency radio drift measurements at 6 sites in Europe as listed in Table 1. The combined measurements provide an observation window over Europe at about 55°N over a longitudinal range of more than 60 degrees, as well as the possibility of direct comparison of measurements at nearly the same longitude. The summary of the measurements from 1985 through 1995 is presented in Table 2; there are several years when direct comparison of different measurements is possible. The monthly means were calculated with different methods. Sheffield, Juliusruh and Collm data were calculated by a regression analysis on a half-monthly data base. The regression coefficients were chosen quadratically dependent on height, therefore the reliability of the results at the highest and lowest levels, respectively, is smaller. Thus, the