the locations of these recording sites with respect to geographic, geomagnetic and L-shell coordinates. Initially, Pc3–4 recording stations will be established at LN, NC, DB and WM. The array follows an earlier one deployed for studying the propagation of Pc1 (0.1–1 Hz) and the longitudinal phase structure of Pc3 pulsations. Phase and polarization measurements across the network will also yield information on pulsation characteristics around the region of the maximum Alfven velocity in the magnetosphere, situated near L = 1.5. This will link hitherto unexplained Japanese observations which are restricted to latitudes corresponding to L < 1.7. The station locations chosen represent a compromise between the ideal case, lying on the geomagnetic meridian, and prevailing geographic and geological conditions such as accessibility and uniform ground structure.

Recording equipment is designed to facilitate economic handling of data. Orthogonally oriented induction coil systems will be linked via dual mode amplification systems to microcomputers which store data in digital form on floppy disc. Timing at each site will be provided by an appropriate chronometer. During the initial planned few months of operation the stations will require only periodic attention to monitor operation and change discs. The NC station will form a reference station and will be equipped with a fluxgate magnetometer and chart recorders in addition to the digital Pc3–4 and Pc1 systems.

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The spatial integration of transient ULF pulsations observed by ground based magnetometers

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The major source of damping for resonant ULF pulsations is thought to be joule dissipation in the conducting ionosphere, determined by the Pedersen conductance, Σ_p. Transient pulsations (i.e. short-lived pulsations with latitude-dependent periods) are toroidal mode oscillations of the geomagnetic field shells (Poulter & Nielsen 1982), and are often associated with SSC and SI. In this paper empirical models of the toroidal mode east-west Hall current density J were used to calculate the associated ground magnetic fields in an attempt to resolve the following points:

(1) decay rates observed by ground magnetometers are in general larger than those observed by satellites and predicted by theory;

(2) estimates of the Pedersen conductance using ground magnetometer derived decay rates seem too low (Glassmeier *et al.* 1984);

(3) ground magnetometer observations of transient pulsations may show little or no period variation with latitude (Allan *et al.* 1985);

(4) the effect of non-monotonic latitudinal period variations (e.g. the plasmapause).

Since a ground based magnetometer integrates the ionospheric currents, any latitudinal period variation results in spatial incoherence of the oscillations. The effects of the spatial integration are shown in Fig. 1, for a Gaussian current distribution of half-width 2°. There is clearly an increased

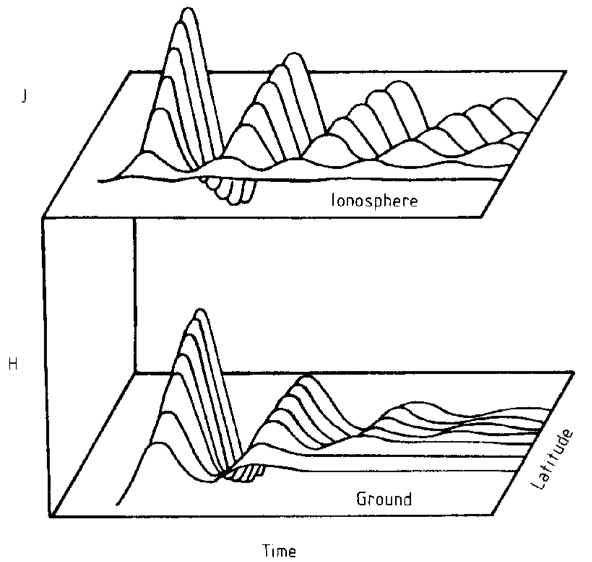

Fig 1 Waveforms of a transient pulsation in the ionosphere and on the ground.

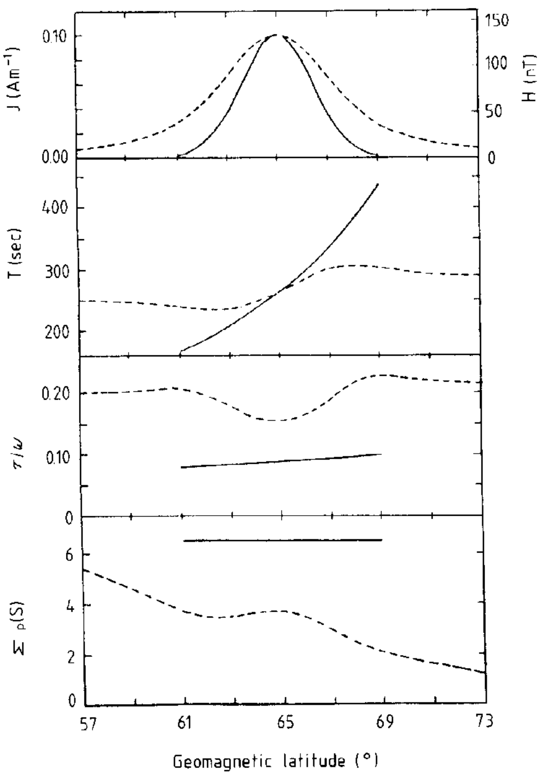

Fig 2 Pulsation parameters appropriate to Fig. 1. The solid lines indicate ionospheric model parameters and the dashed lines, ground magnetic H component parameters.

decay rate on the ground. Note also the amplitude spreading with latitude and the reduced rate of period variation on the ground. This is demonstrated quantitatively in Fig. 2 which shows the ground magnetic H components resulting from the ionospheric east-west Hall current density J. Away from the current peak there is little period variation, supporting the contention of Allan *et al.* (1985) that their event had constant period on the ground because the magnetometers were located outside the main current region of the pulsation event. The damping decrement γ/ω is $\sim$2–3 times larger on the ground, consistent with the larger values reported, and Σ_p estimates are correspondingly reduced.

Near the plasmapause, the equatorial ion density variation results in a latitudinal period variation with two turning points separated by a rapid period decrease with latitude. The toroidal mode eigenoscillations observed on the ground decay rapidly where there is a rapid period variation and hence low coherence. However, the coherence near the period turning points results in additional essentially monochromatic oscillations at ground level. The spectra of transient magnetic oscillations near the plasmapause can therefore contain both latitude dependent and latitude independent components, as determined experimentally by Fukunishi (1979). Heavily damped oscillations in the vicinity of $L=4$, which is the expected plasmapause position, have been attributed to surface waves on the plasmapause (Lanzerotti *et al.* 1975). Model transient waveforms with both heavy damping beneath the plasmapause, and more regular oscillations at lower latitudes suggest that an alternative interpretation to surface waves is that these oscillations may be transient pulsations in the vicinity of the plasmapause.

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