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The five minute solar oscillation

We have computed models with solar luminosity and radius. Two sequences of evolution were computed with an initial composition X=0.7417, Y=0.2383, Z=0.02, the first one with the equation of state adopted in the Henyey code (Boddenheimer et al.,1965) and the second one with the equation of state of Rouse (1967,1968,1971ab). The nuclear reaction rates are those of Fowler et al. (1967), the opacities, those of Cox and Stewart (1970) and Alexander (1975). Then, in both cases, we have computed models of envelope with a thicker convective zone. All these models include a chromosphere (Vernezza, 1973).

The f mode and a few p modes were computed for ℓ ranging from 200 to 800 and compared with the observations of Deubner et al. (1979). The radial and non radial modes for low values of ℓ (0,1,2,3) with frequencies between 2.3 and 4 mHz were also computed and compared with the observations of Claverie et al. (1979,1980), as the sensitivity of their observational technique becomes very low for $\ell \geq 4$ (Christensen-Dalsgaard,1980). Both comparisons favour our model with the thickest convective zone (10 per cent in mass). For the modes with low ℓ values a good agreement with the observations would be achieved when the convective zone contains a little less than ten per cent of the mass. This conclusion is consistent with that of Rhodes et al. (1977) but in opposition with that drawn by Claverie et al. (1979) on the basis of the dirty solar models of Christensen-Dalsgaard et al. (1979).

At the present time we have not yet studied a model with Rouse's equation of state and with a convective zone thick enough to be compared with the observations. Nevertheless these models seem to require thicker convective zone to be favourably compared with the observations.

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