

**SURFACE WAVE DISPERSION ABOUT THE  
NEW MADRID REGION**

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# Digest

The dispersion properties of surface waves encode information about the structure of the Earth. In this thesis I obtain group velocity dispersion curves and local phase velocity dispersion curves for a set of earthquakes and explosions. Specifically, the data set consists of 50 events recorded in the Cooperative New Madrid Seismic Network (CNMSN), run by Saint Louis University, and the Alabama earthquake (October 24, 1997) recorded by 48 stations spread over North America.

In obtaining the group velocity curves I use the Multiple Filter and the Phase Matched Filter techniques. The combination of these two techniques permits isolation of the fundamental mode to obtain cleaner group velocity dispersion curves. The group velocity dispersion curves are used to test the viability of the Stevens' model, a global model developed under the Comprehensive Nuclear-Test-Ban Treaty (CTBT) monitoring. The results of the test show that the Stevens' model works well in the range of periods between 10 and 160 seconds (with differences between observations and prediction within  $\pm 3.3\%$  at 20 seconds). For periods larger than 160 seconds the model overestimates the values of the group velocities dispersion curve (at 260 seconds the overestimations are around  $12.5 \pm 2.5\%$ ).

Once the fundamental mode is isolated the local phase velocity dispersion curves are calculated with the  $p-\omega$  technique. I have checked the performance of this technique, developed for linear arrays in reflection and refraction experiments, in the non-linear CNMSN array. For some particular earthquakes, those with the best station coverage and the clearest disper-

sion curves for a wide period range, the technique works surprisingly well (the differences between observations and predictions are within 5%). For these events the local phase velocity dispersion curves fit the predictions of the HAMBURG model for central U.S. (Herrmann and Ammon, 1997). For the other earthquakes, the  $p - \omega$  technique has not been successful. Further studies are needed to better improve this technique.