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Some lessons learned after the Ashigara Valley blind prediction test

E. Faccioli & R. Paolucci
Department of Structural Engineering, Technical University of Milan, Italy

Some salient aspects of earthquake ground motion prediction have been pointed out by the Ashigara Valley experiment, namely:

•the **accurate determination of the S-wave velocity profile** in surficial soil layers overlying stiffer materials, as well as their thickness, can be critical, as shown in Fig.1 by the comparison of the 1D transfer functions for the standard profile and for the actual boring log at KS1.

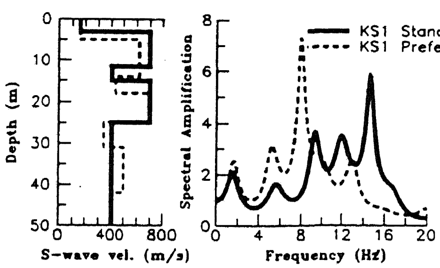

Fig.1

•The **reference rock site** for incident motion must be free from site effects. This may not have been the case of KR1 site, adjacent to a rather steep slope; anyway, the differences among possible input motions seem to be significant only between 5 and 10 Hz (see Fig.2, where the deconvolved input at KR1 is obtained by the 2D transfer function illustrated in Faccioli and Paolucci, ESG 1992, Vol. II, pp. 89-90., Fig.1). In future experiments, the incident motion must be either the object of an accurate preliminary analysis or it should be defined on more than one site.

•A linear **relation between internal soil damping and frequency**, $Q=q_0f$ (Kobayashi et al., ESG 1992, Vol. I, pp.269-274), appears to be adequate at long periods (Fig.3); for shorter periods a frequency-independent Q gives better results, particularly for the prediction of a_{max}.

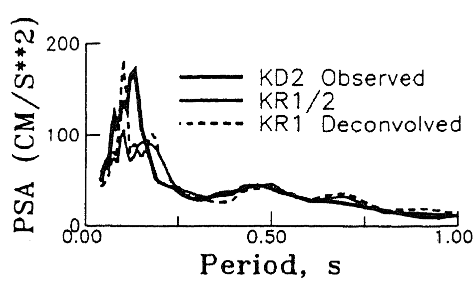

Fig.2

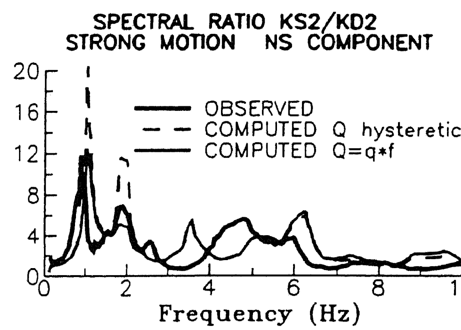

Fig.3

•**2D or 3D effects** had clearly limited influence on the results, particularly for response spectra prediction (Fig.4); existing criteria for assessing the expected influence of 2D/3D vs 1D effects are not entirely satisfactory inasmuch as they are based on the overall geometry of alluvial deposits rather than on their local characteristics. Further studies and data are also required for better defining the excitation levels for which **non-linear effects** begin to have a strong influence on ground motion.

•As regards the **computational methods** used, the results show that all linear or linear-equivalent models, with judiciously chosen

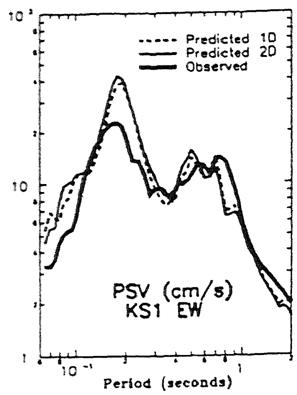

Fig. 4

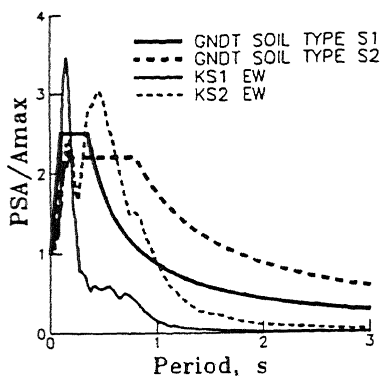

Fig. 5

values of the soil parameters, performed satisfactorily. For future experiments it is recommended to establish some a priori criteria to assess the quality of a single prediction.

•The prediction in terms of a_{max} was generally not satisfactory, as it is subject to many sources of error (fine details of the stratigraphy, damping relation, performance of the computational method at high frequencies).

•When normalized by a_{max}, the observed response spectral shapes agree reasonably well with those commonly defined for standard soil types (Fig.5).