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Microearthquake Analysis, crustal Stresses, and Earthquakes

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It is quite obvious that the crustal stresses plays a key role in the crustal deformations and for both stable and unstable fault slip (earthquakes). In spite of this obvious knowledge stresses are normally not included in algorithms for earthquake prediction. As a comparison hardly any wheather forecast is produced without making fundamental use of the air pressure field. When the so called SIL (Southern Iceland Lowland) project was started in 1986 it was decided to be aimed at making full use of physics for improving the earthquake warnings (Stefansson et al 1991). It was therefore decided to create a microearthquake monitoring system that would be able to analyse microearthquakes down to zero magnitude (ML) with the routine analysis methods developed at FOI for the southern Sweden earthquakes. Angelier et al (in press) have showed that the quality of the estimated source mechanisms of the microearthquakes is rather independent of magnitude, valuable source mechanism information can be retrieved from microearthquakes below zero ML within the SIL network (the distance between the stations is about 20 km). Although the Icelandic crust is not very favourable for wave propagation the urban noise is low. It is however required that the instrumental sensitivity is high to reduce disturbances due to the internal instrumental noise. The low detection threshold within the SIL network gave a large number of analyzed microearthquakes within the area from 1991 up to the two Ms 6.6 earthquakes June 17 and 21 2000. This allowed a rather detailed mapping of the stress tensor field within the SIL area before the earthquakes. The results indicate indeed that stress mapping by use of microearthquake recordings may be of major importance for accurate and reliable earthquake predictions. I think that the results also show that the existing seismic networks around the world should be operated to detect and analyze as

small microearthquakes as possible. As most analysis is today automatic this is not requiring a lot of expensive manpower but it requires high sensitive stations placed in lowest possible noise conditions, if necessary in boreholes. Also for the many early warning systems the accurate knowledge of the places of future earthquakes can give some seconds earlier information by having a station at best possible position.