



## **Application Notes R-1 Rotational Seismometer**

A description of some applications on how and where measured rotations utilizing the high sensitivity R-1 Rotational Seismometer would be useful:

### **On the weak motion side (for Seismology):**

1. Measured rotations can be used for better identification and separation of Love from Rayleigh waves.
2. Enables better and more unique interpretation and identification of P versus SV versus SH wave components.

### **On the strong motion side (Earthquake Engineering):**

1. Recorded rotations in and near foundations of structures can provide for the first time means to separate the effects of soil-structure interaction from the total recorded (translational) response.
2. Rotational data can provide for the first time a detailed picture of the relative inter-story drift, (i.e. will enable engineers to separate contributions of rocking from those of relative deformation).
3. A more accurate identification of relative story drift will provide more realistic estimates of P-delta effects.
4. Simultaneous recording of 6-degrees of freedom (DOF) of accelerations will enable computations of permanent displacement in structures, of soils and in the near field of shallow earthquake faults.
5. Recording of permanent rotations in structures and in soils will open new possibilities for accurate interpretation of non-linear deformations in the field and for verification of numerical codes and software which simulate those deformations.
6. The boundaries of many structures coincide with their supports. At these boundaries the displacements are either small or zero, and so the measured translational data brings little or no experimentally defined constraints to check theoretical or empirical models. Rotations on the other hand are often largest near supports (e.g. consider a simple beam) and therefore measuring rotations will provide excellent and the most direct data to compare against theory.

### **Outside Seismology and Earthquake Engineering.**

1. Continuous records of rotation can be used to monitor slope stability.
2. Monitor differential settlement of various structures.

### **General.**

1. Since rotations are related to the first partial derivatives of displacements (w.r.t. space coordinates), measured rotations can be used together with displacements to form two term Taylor series approximations of a displacement field. This may be a very important and helpful feature for dense array observations (such as oil exploration), as it should allow for wider station spacing, while not compromising the needed information.

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