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Verification of axial-dependent properties of commercial seismometers

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Modern broadband three-component seismometers have theoretically well defined basic parameters, such the generator constant and the orthogonality of components with almost identical transfer functions for all three axes. Seismometer manufacturers build their instruments with high precision and with orthogonal horizontals but in practice there will be almost always some errors in the mechanical alignment. Consequently, some small differences in the transfer functions and gain constants can be expected. In our approach to this problem we have developed an algorithm to study deviation in angles of components and the ratio of gain constants for an unknown seismological system when compared to a reference seismological system. We examined the ratio of gain constants and orthogonality between two STS-2 type seismometers. One instruments, connected to a Quanterra Q730 acquisition unit and well temperature stabilized, served as our reference system, while the investigated instrument was connected to an EartData PR6 acquisition unit without additional temperature isolation while the parameters of gain constant for the digitiser were not known. Tests were performed for a time period of 26 days. For a typical triaxial seismometer the manufacturer adjusts the orthogonal output signals before shipping to represent motions in the geometrical X, Y, and Z axis of the seismometer (e.g. within of 1 percent (0.6 degrees) at a period of 6 sec). Similar accuracy is given for the gain constant. Our preliminary results confirm the manufacturer's specification while the average values are even better.