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Impact structures in conglomerates allow determination of five unknowns of the paleostress tensor: the Hoyenshan case, Taiwan

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The inversion of fault slip data to determine paleostress is a common technique in tectonic studies. A stress tensor includes six independent variables, the principal stresses and three angles that describe the orientation of principal axes. The isotropic component of the stress tensor and the scale factor are not constrained by shear orientation data, so that the six variables reduce to four unknowns: three angles and a ratio of stress differences, Φ.

A new stress inversion is based on the mechanical assumption that where two boulders are in contact and submitted to a stress large enough to induce fracturing and development of an impact structure, the impact axis is parallel to the applied stress vector. Not only does the orientation of the impact axis depend on the four unknowns listed above, it is also function of a fifth unknown, η, indicating the size of the isotropic component of stress with respect to the deviatoric stress. The inversion aims at finding the best fit between observed impact axes and calculated vectors of applied stress.

Our inversion of 252 impact structures collected in Quaternary conglomerates at Hoyenshan indicated WNW-ESE trending compression, consistent with both the stress regimes indicated by inversion of fault slip data sets and the general information on the compression across the Taiwan belt. The ratio of stress differences, Φ, reveals typical triaxial stress. The fifth variable, η, reveals large lithostatic pressure with re-

spect to deviatoric stress, and hence relatively low levels of differential stress at such shallow depths.