Borehole breakout data

Borehole breakouts are stress-induced enlargements of the wellbore cross-section that occur when a well is drilled in rocks in an anisotropic stress field (Bell and Gough 1979; Zoback et al. 1985). They develop in two opposite zones of the borehole wall along the direction of the minimum horizontal stress ($S_{\text{hmin}}$). We determine breakouts by using ‘four-arm caliper’ tool following the main criteria reported in Plumb & Hickman (1985). We use deep vertical well data (down to 7 km) and discard the data up to 450 m depth. We apply the circular statistics of Mardia (1972) to compute, for each borehole, the mean breakout orientation and its standard deviation (95% confidence interval) weighed by length of breakout intervals. Usually, breakout zones are plotted as a rose diagram, with bars proportional to cumulative breakout lengths. The World Stress Map project quality ranking system (Heidbach et al. 2010) used to classify the breakout orientation of each well, from A to E, takes into account the number of breakout zones, the total length of breakouts and the variability of the measurements (standard deviation of the orientations, sd).

WSM guidelines, see §4.