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Field estimates of fracture compliance and implication on rock saturation

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In the frame of reservoir characterisation, a major interest has been in imaging fractures, as they represent a natural pathway for fluid flow in these settings. Fracture sets are likely to exhibit seismic anisotropy, which is controlled by the normal and tangential compliance of the fractures, Z_N and Z_T, respectively. Fracture compliance ratio (Z_N/Z_T) is in turn controlled by fluid fill and is then considered to be a good indicator of permeability in fractured rocks. As a field scale experiment, we performed three hammer seismic surveys on a wave-cut platform located on the southern margin of the Bristol Channel Basin, UK. We measured P-wave velocities at different azimuths to investigate the impact of the fractures on the local anisotropy. In order to investigate temporal variation of Z_N/Z_T, we performed three similar seismic experiments at two hours interval after the high tide. We detected an increase of Z_N/Z_T over time, mostly due to a dramatic drop of the shear compliance. We also measured an increase of the seismic velocities during the experiment. We attributed these two observations to the draining of the fractures as the tide is getting out. Such experimental observations have the potential to give a better insight into reservoir exploration.