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Hydrochemical characterization of waters on the rockslide site of Åknes (western Norway)

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The bedrock of the Åknes rockslide is composed of massive orthogneiss (quartz, feldspars, micas, chlorite), with locally some cm-layers of micaschists (mica, chlorite). Pyrite is present as an accessory mineral and can be observed macroscopically. Eight spring waters have been sampled in the slide area, from the altitude of 640 m downwards to 120 m above sea level. In addition to the usual field measurements, trace and major elements have been analysed (IC/ICP-AES). More conductive waters (up to ˜500 micro-S/cm) have been logged and sampled in boreholes. The chemical analysis of these waters is in progress. All the spring waters are diluted waters, and their compositions are typical from subsurface waters on a granito-gneissic substratum (no long-residence deep groundwater). The electrical conductivity increases progressively downwards the slope, from 17 to 107 micro-S/cm. The hydrochemical facies evolves in parallel with the conductivity (Jaeckli's notation): Na-Ca-HCO3-(Cl) for the most diluted waters at the top (˜20 micro-S/cm), Ca-(Na)-HCO3-SO4 for the intermediate springs (˜50 micro-S/cm), and Ca-(Na)-SO4-HCO3 for the most concentrated waters at the bottom (˜100 micro-S/cm). This evolution reflects directly the duration of the water-rock interaction. Thermodynamics modelling shows that two accessory minerals play the main roles in this interaction: the pyrite providing SO4 and the calcite providing Ca to the solution. Because of the differences of dissolution kinetics between silicates, carbonates and sulphurs, less than 1% of the rock forming minerals is actually controlling the chemical composition of the water. These properties can be used to estimate the duration of the water-rock interaction (normalized for a surface of reaction).