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Vertical fluid pathways in passive margins

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Fluid expulsion from marine sediments on passive margins is generally a slow process controlled by compaction of the sediments during burial. However, substantial overpressures can build up if sediment permeability is low and fluid expulsion rates are high. In such cases fluid pathways change from a diffusive pattern to more focused fluid pathways. We present evidence for this change in fluid pathways for five different sedimentary environments: (1) flow focusing due to polygonal faulting, (2) flow focusing due to large-scale liquidization resulting in mud volcanism (3) flow focusing due to natural gas hydrates changing rock permeability, (4) blow-outs from natural gas reservoirs due to fast reservoir filling, and (5) fluid expulsion due to rapid pore fluid expulsion from heated sediments around volcanic sill intrusions. Although the duration of the processes and the affected sediment volumes are very different, their geophysical expression as blow-out pipes is remarkably similar. It is necessary to understand the physical processes that govern these fluid pathways in more detail in order to assess their impact on seabed (benthic) ecology, the distribution of hydrocarbons in the subsurface, and for deciphering the climate record in the past in order to make predictions for global warming.