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Seismo-volcanic source mechanism in White Island's hydrothermal system

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The signals preceding and accompanying phreatic eruptions, although observed on many volcanoes, are still not very well understood. As this type of eruption can have severe consequences, we need to understand the processes and the observed seismic signals leading up to these eruptions. Using seismic broadband instruments, we can detect signals in a wide frequency range, and careful analysis and modelling of these data can help us understand these processes. Phreatic eruptions are often accompanied, and sometimes preceded, by Very Long Period (VLP) seismic signals. These signals are caused by sudden pressure changes inside the volcanic system and in hydrothermal environments these pressure changes and, therefore, observed VLPs are attributed to the sudden expansion of water-filled cracks by vapourisation due to heat flow from the underlying magma body.
However previous studies consider pure water-water systems which sometimes assume unrealistic pressure-temperature changes in the system to produce a violent phase change from water to vapour. As there are instances of significant amounts of CO_2 measured within hydrothermal systems, we model how a sudden injection of CO_2 into the hydrothermal system, which would easily allow for explosive phase change could trigger the observed VLPs. Further, we show how poroelastic medium responds to such a source.