CASL Computational Science Seminar

Title: Volcano Seismicity: Modelling the origin of seismic activity

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Location: CASL Seminar Room - Belfield Office Park

Abstract: Volcanoes can produce sounds as the magma (lava), gases and water flow inside the volcano. These sounds are inaudible but can be recorded as seismic signals. Different types of signals can indicate different fluid motion. By understanding how these signals are created we can better understand the volatility of the volcano. The high degree of variability in the generation of volcano seismicity presents a difficult challenge in modelling seismicity in volcanoes. Therefore, using seismicity as a precursor to an eruption is difficult and only through a better understanding the dynamics can we increase our forecast capabilities. Seismic signals recorded on a volcano can be classified into several distinct sets. These families of events span a continuum from ultra-long period events with dominate periods of 100s of seconds through very-long period events to long period (LP) events in an analogous manner to the visible light spectrum. It is now well established that low frequency events are linked to fluid flow through cracks and conduits. This makes them useful in accessing the internal state of the volcanic plumbing system. By using recent advances in techniques for seismic modelling and high performance computing we can increase our understanding of these signals. High performance computing also enables us calculate Greens functions for complex volcano models. Given the Green's functions derived from numerical synthetics and the real physical observations we can invert for

the moment tensor. If our Earth model is a perfect representation of the actual Earth then the moment is equivalent to our real Earth moment tensor. The moment tensor represents the forces acting on a point and describes the physical forces generated by the source. This description of the forces is a vital constraint on determining the actual physical mechanism generating these forces. Even though the role of fluid dynamics in generating volcano seismicity has been well established the actual physical processes are not yet fully determined. By a combination of computational fluid dynamics and computational seismology using high end computing we can study the role of fluids in generating the observed signals recorded on active volcanoes.

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