V230-P002 **Room: Poster Session Hall** **Time: May 26**

Nonlinear physics in bubble 'buku-buku' process with application to quasi-periodic volcanic eruptions

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In order to mimic in the laboratory the dynamics of bubbles rising in magma and volcanic explosions, we have setup the following experiment: a plexiglas cell containing a fluid is connected to a constant air flux supply, adjusted with an air flow controller, and monitored by a pressure sensor. Bubbles are generated at the bottom of the fluid column, then rise and burst at the fluid free surface. We monitor and analyze the sound produced by the successive bubble bursting, while both bubble rising and explosion dynamics are monitored by a normal and high-speed video camera. Newtonian and non-newtonian fluid rheologies are compared.

We observed different acoustic waveforms, depending on the fluids and/or bubble explosion. In newtonian fluid, most of the burstings are 'silent', with no acoustic wave generation ('puffing' regime), while all bubbles bursting at the surface of a non-newtonian fluid generate a sound wave. The waveform of this acoustic wave varies from one bubble to the other, even when keeping all experimental parameters (fluid concentration, air flux) constant. Images taken by high-speed video camera showed that the film rupture time strongly affects the waveform. Moreover, more careful observations of the acoustic signals made it possible to find the existence of a 'precursor' acoustic signal, occurring before bursting. The time delay between this precursor and the bursting signal varies quasi-periodically with time, and is directly correlated to the changes in the acoustic waveform and its frequency content. Time-frequency analysis pointed out gliding frequency of the higher harmonics, a feature observed on volcanoes, but still unexplained at present day. We also observe isolated infrasonic waveforms between two successive burstings, associated either with the formation of a plug at the bottom of the liquid column (newtonian fluid), or with bubble coalescence while rising (non-newtonian fluid). These experimental results made it possible to understand some of the physical mechanisms at stake in the dynamics and acoustics of bubble bursting at the top of a liquid column, and look promising for the understanding of volcano acoustics.