Continuous CO_2 flux monitoring at Taal Main Crater Lake

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Carbon dioxide flux measurements using the accumulation chamber have been performed regularly since 2008 on the Main Crater Lake (MCL) of Taal Volcano. Large variations have been seen up to one order of magnitude. However, gas bubble density maps made after regular single-beam sonar surveys between 2011 and 2015 show very little variation, suggesting carbon dioxide migrates primarily in dissolved form. Dissolved carbon dioxide (pCO_2) in the lake waters was measured in situ by an infrared gas analyser protected by a PTFE membrane. Spot measurements indicate that pCO_2 is very homogeneous over the entire lake, except for a positive anomaly in the northeast sector of the lake where upwelling of hydrothermal water occurs. A permanent monitoring station was installed in MCL in 2013, continuously measuring dissolved carbon dioxide. pCO_2 and CO_2 flux are highly correlated. This confirms that most of the carbon dioxide is transported to the lake in dissolved state and allows us to calculate CO_2 flux directly, dramatically increasing the temporal resolution of this important monitoring parameter.

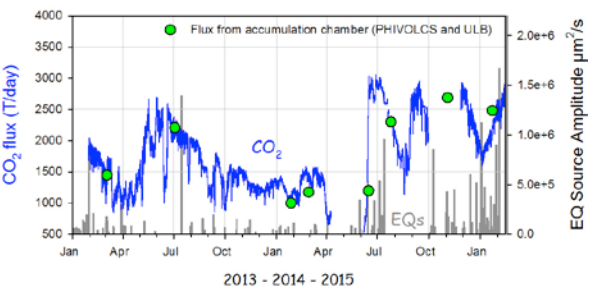

Figure 1: Continuous measured and calculated CO_2 flux emitted by Taal MCL. Earthquake source amplitude as reference for volcanic activity.