# Precursory Soil Radon Anomalies Related to the Major Earthquakes in Taiwan

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Several automatic stations for soil gas monitoring were constructed on sensitive sites at the fault zone of Taiwan. Significant changes in soil-gas radon of four stations were recorded two weeks efore the Jiasian earthquake (Mw = 6.4, March 4, 2010). Recurrent anomalies were observed prior to one week before precede the Wutai earthquake (Mw = 6.4, February 26, 2012) and the Nantou earthquake (Mw = 6.4, March 4, 2010) occurred at more than two stations, respectively.

The main shock occurred at 15-26 km depth, in a relatively low background seismicity rea, in the middle to low crust, implying ductile beneath Central Range. Assuming that stress magnitudes are consistent with the pore-fluid pressure, a high conductivity zone at depth, which is interpreted to transfer the compressional driving force across the brittle-ductile transition, with more efficient stress interconnectivity in the high strain domain. Moreover, variations of soil gas can reflect a change in the stress-strain state of rocks, such as useful tools for earthquake surveillance.

Hence, there is obvious that the soil radon anomalies originated in stress accumulation preceding the major earthquakes. Variations of soil radon at several stations show precursory signals simultaneously that can conduce to expect the approximate location of the impending seismic event with high confidence. Continuous monitoring will allow us to better understand the relationship between soil gas variations and regional crustal stress/strain in the area.

# Elemental and Os isotope variations across the K/T boundary in a marine Fe-Mn crust

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Marine Fe-Mn crusts grow slowly and contain distinctive laminar growth layers which have potential to document the evolution of ocean chemistry and major geologic events. The K/T boundary (KTB) is associated with the mass extinctions of terrestrial and marine organisms, most likely caused by a bolide impact or/and the Deccan volcanism. In this study, we explored the elemental and Os isotope variations in successive layers across the KTB in a marine Fe-Mn crust, MP2D06, from Line Seamount in Central Pacific Ocean.

The Fe-Mn crust has been dated using Co flux-based age model and Sr isotope stratigraphy. Then the successive layers samples from the crust spans the time interval from about 58 to 74 Ma were analysed. The element composition was determined along continuous sections of the crust using EPMA and LA-ICP-MS. The $^{187}Os/^{188}Os$ ratios were measured by acid digestion and ID-HR-ICP-MS.

Preliminary data show that the Ir peak does not correspond with the low Pt/Ir and Os/Ir ratios in the sections. This implies that it is difficult to decide the exact location of KTB in the Fe-Mn crust just using the concentration variation of PGE. There is a rapid decrease in $^{187}Os/^{188}Os$ from values 0.683 to 0.336, then followed by an increase to 0.453. The large amplitude Os isotope excursion has distinctive features to help improve the reliability of Os isotope stratigraphy in Fe-Mn crust age determinations. Mass balance estimation indicates that the $^{187}Os/^{188}Os$ minimum across KTB was caused by both bolide impact events and the eruption of the Deccan flood basalts.

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