# 'WEERTMAN' cracks: A possible mechanism for near sonic speed diamond extraction from the Earth´s mantle

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'Weertman' cracks are two-dimensional liquid-filled cracks, which can move with a velocity close to Rayleigh-wave speed driven by the buoyancy or gravitational potential energy of the fluid and external stress fields. Therefore 'Weertman' cracks would be a potential transport mechanism for the diamond bearing kimberlitic-melt from the Earth's mantle to the Earth's surface. Arguments for the formation of 'Weertman' cracks are threefold: i) The geometry of kimberlite pipes resembles the shape predicted by 'Weertman' cracks; ii) Like Weertman cracks kimberlites themselves never develop an explosive stage besides the phreatomagmatic eruption due to contact with groundwater close to the Earth's surface; the melt often gets trapped near the Earth's surface; iii) The speed for the uplift of the diamonds from >150 km depth must be larger than 800 km/h to explain preservation of diamonds. The question to be answered is: What method can be used to confirm the formation of 'Weertman' cracks? Here we show that OH-diffusion profiles in nominally water free minerals, recorded from quenched diamondiferous host rock, are indicative for near sonic speed diamond extraction from the Earth´s mantle. This unforeseen discovery shows that 'Weertman' cracks are the only possible transport mechanism for diamonds from the Earth's mantle to the surface. Further, our findings show that the observed breadths of kimberlite pipes are surprisingly short, given the fact that the magma ascends from depths is in order of up to ~330 m/s. The ascent rates of kimberlites are of high economic interest, because if the diamonds are to long in contact with the kimberlitic melt they start to dissolve within a few minutes.

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# Provenance discrimination of plants from three bedrock types using strontium isotopes and chemical analysis

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This study is to assess the inter–lithological variations in the stable Sr isotopes that define an ecosystem/ habitat nutrient cycle and their signature in the aboveground vegetation. Five plant species, *Acacia sp*., *Zelkova serrata*, *Prunus serrulata*, *Capsicum annuum*, *Zea mays* and *Allium fistulosum* commonly found growing on granite, limestone and basalt formations were selected. Our hypothesis is based on the two facts-one the $^{87}Sr/^{86}Sr$ ratios depends on geological regime and this ratio varies significantly from one geological formation to another [1]. Second plants display particularly strong isotopic signals because they construct their tissues from such small molecules [2]. Based on these premise this natural phenomenon can be put into use to explain inter–lithological differences and effects of these inter–lithological variations on plant nutrient physiology.

Preliminary analsysis shows that $^{87}Sr/^{86}Sr$ ratios of tree leaves and fruit vegetables varied according to bedrock types in which they grow. $^{87}Sr/^{86}Sr$ ratios of plant leaves and vegetables well reflected the geological characteristics of three regions where they were grown.

[1] Faure (1986) *Principles of Isotope Geology*, Wiley. [2] Marshall *et al*. (2007) *Sources of variations in the stable isotope composition in plants*. Blackwell Publishing.