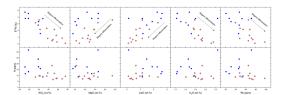
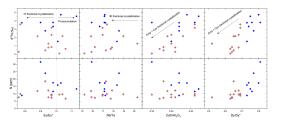
## Nitrogen isotope compositions of the Gangdese calc-alkaline plutons, Southern Tibet: Implications for N isotope fractionation during continental arc mafic magma differentiation

**PENG WU**<sup>1</sup>, LONG CHEN<sup>2</sup>, YUANBAO WU<sup>3</sup>, YUNZHE CHEN<sup>4</sup>, YIFAN DU<sup>4</sup>, XUEQI LIANG<sup>4</sup>, AMBER JIE YU<sup>4</sup>
AND LONG LI<sup>4</sup>

Magmatic differentiation at convergent margins plays a crucial role in the formation of felsic continental crust. However, little is known about the geochemical behavior of stable nitrogen isotope systems during magmatic differentiation. To address this issue, we present whole-rock N concentrations and  $\delta^{15}$ N values of two calc-alkaline plutons with compositions ranging continuously from gabbro to diorite from the Gangdese batholith, Southern Tibet. The gabbroic Numa pluton exhibits wide range of N concentrations (8.9-31.6  $\mu$ g/g, average = 17.5  $\pm$  7.3  $\mu$ g/g, 1SD) with elevated  $\delta^{15}N$  values (+1.5~ +4.7%, average = +3.6 ± 1.0%), while the more differentiated Namling pluton shows slightly lower N concentrations (6.7-18.5  $\mu$ g/g, average = 10.0  $\pm$ 3.2  $\mu$ g/g) and lower  $\delta^{15}$ N values (+0.1 $\sim$  +3.6%, average  $\delta^{15}$ N =  $+1.5 \pm 1.2\%$ ). Overall, the studied samples show a progressive depletion in <sup>15</sup>N (>5‰) as the mafic magmas evolve into more differentiated intermediate magmas. This depletion cannot be attributed to magmatic degassing or crustal contamination, as these processes would be expected to lead to <sup>15</sup>N enrichment. Instead, whole-rock δ<sup>15</sup>N values strongly correlate with geochemical indices such as CaO/Al<sub>2</sub>O<sub>3</sub> and Dy/Dy\* ratios, suggesting that fractional crystallization of clinopyroxene (and/or amphibole) is the most likely mechanism responsible for the <sup>15</sup>Ndepletion in the residual melt. This is because inosilicates are significantly more enriched in <sup>15</sup>N than other ammonium-bearing silicate minerals<sup>[1]</sup>. No correlation is observed between  $\delta^{15}N$ values and Eu/Eu\*, suggesting that plagioclase crystallization has little effect on N isotope fractionation. On the other hand, variations in whole-rock N concentrations do not correlate with the degree of magmatic differentiation, indicating that the degassing loss of N (as N<sub>2</sub> in the melt) may at least counteract the enrichment of incompatible NH<sub>4</sub><sup>+</sup> (rock-fixed N species) induced by magmatic differentiation during its early stages. In summary, our study concludes that fractional crystallization of clinopyroxene (and/or amphibole) in calc-alkaline systems. overriding other processes such as magmatic degassing, would effectively fractionate the N isotope compositions of arc magmas, thereby modulating the N isotope signature during juvenile crust formation.





<sup>&</sup>lt;sup>1</sup>Chengdu University of Technology

<sup>&</sup>lt;sup>2</sup>Ocean University of China

<sup>&</sup>lt;sup>3</sup>China University of Geosciences, Wuhan

<sup>&</sup>lt;sup>4</sup>University of Alberta