

## Interannual and decadal variability of sea surface condition recorded in Guam coral for the years 1787-2000

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### Abstract

We have examined skeletal records in a 213-year (1787-2000) coral core, GD2, from Guam in the western Pacific. Carbon and oxygen isotopic composition ( $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$ ) of GD2 was measured at high-resolution (10-15 days/sample) for the last 20 years. In this period, a stronger statistical relationship exists between SST (Sea Surface Temperature) and  $\delta^{18}\text{O}$  for ENSO (El Niño/Southern Oscillation) warm phases ( $r=-0.81$ ) than its cool phases ( $r=-0.48$ ). These different relations are a manifestation of changes in the winter SST and in seawater  $\delta^{18}\text{O}$  during ENSO warm versus cool phases, which reflects the migration of WPWP (Western Pacific Warm Pool). Seawater  $\delta^{18}\text{O}$  anomalies, inferred from GD2 coral, are consistent with SSS (Sea Surface Salinity) anomalies and may reflect changes in evaporation-precipitation ratio due to the migration of WPWP. Our detailed investigation of 1980-2000 records demonstrates that GD2 is a potentially excellent archive recording the past ENSO events.

$\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  records measured at monthly resolutions for the entire core clearly show seasonal variations averaging  $-1.64\text{‰}$  (ranging from  $-3.43$  to  $-0.34\text{‰}$ ) and  $-5.03\text{‰}$  (from  $-5.36$  to  $-4.61\text{‰}$ ), with mean amplitude of  $<0.25$  and  $<0.60\text{‰}$ , respectively. By comparing these records with those for the period of 1980-2000, we can reconstruct the ENSO events for the past 213 years. Our results generally accord with the reconstructions by Quinn (1987) and Trenberth (1997). Annual  $\delta^{18}\text{O}$  values gradually decrease from  $\sim-4.80$  to  $\sim-5.20\text{‰}$  for the last two centuries. This decrease may correspond to the increase in SST of  $\sim 2^\circ\text{C}$ . However, taking account of variations in seawater  $\delta^{18}\text{O}$  and in degree of disequilibrium caused by vital effects (e.g., variations in skeletal growth), we can conclude that the warming of Guam SST may be  $<0.5^\circ\text{C}$ .

The Pacific climate is characterized by uni- to multidecadal fluctuations such as PDOs (Pacific Decadal Oscillations) that may be related to ENSO events and 'regime shifts (climatic jumps)', each delineated by an abrupt transition from one quasi-steady climatic state to another in the North Pacific (e.g., in 1925/26 and 1976/77). In  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  records of GD2 for the last two centuries, we can detect some periodical fluctuations which may correspond to the Pacific climatic and oceanographic changes such as the PDOs and the regime shifts.

### References

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## Geochemistry of peridotite minerals in Yubileynaya and Zarnitsa pipes: Two mantle terranes

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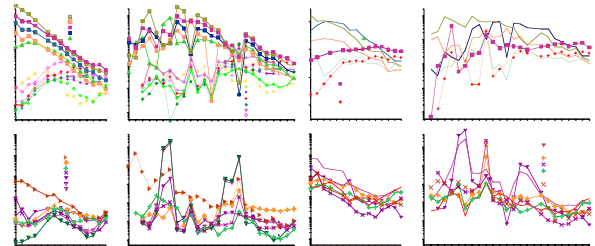
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### Results.

Peridotite minerals in concentrate from kimberlite pipes Yubileynaya (YuP), Alakite field and Zarnitsa (ZaP), Daldyn field analysed by LAM ICP MS (in UIGGM) reveal high LILE, LREE, Th enrichment for first pipe and more depleted compositions and U-Pb peaks for the second pipe. Richterite (pargasite), mica content CPx's LREE rises with depth for YuP. Parental melts for Gar are (H)REE lower than for CPx. TRE patterns for Cpx (and Gar) from ZaP are hampered, less inclined. Ilmenites and chromites demonstrate close REE W-type REE pattern for ZaP and LREE -rich for Za. CPx (Nimis, Taylor, 2000), (Ashchepkov, 2002) thermobarometry detects 8 layers for Yubileynaya (40 mv/m<sup>2</sup> geotherm) supported by Cr<sub>2</sub>O<sub>3</sub>-CaO (Sobolev, 1974) for garnets and to 4 layers (35 mv/m<sup>2</sup>) heating in basement, gap in 45-55 kbar for ZaP. Diamond inclusions are from low dunite and cover (metasomatic for YuP) layers. ZaP kimberlite high in HREE refer to low Gar modal values in mantle.



**Figure 1:** TRE diagrams for minerals and parental melts a) Yubileynaya and b) Zarnitsa pipes

### Discussion and Conclusions.

Layering in the mantle creating during continental growth was accompanied metasomatism in the mantle columns rising with depth refer to continental subduction-related melt-fluids for YuP and to oceanic type for ZaP. Ilmenites trace the polybaric pre-eruption system formed by plum according to AFC. Amount of PT intervals and groups for major minerals are close. RBRF: 05-99-65688, 03-05-64146, 02-05-64248.

### References

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