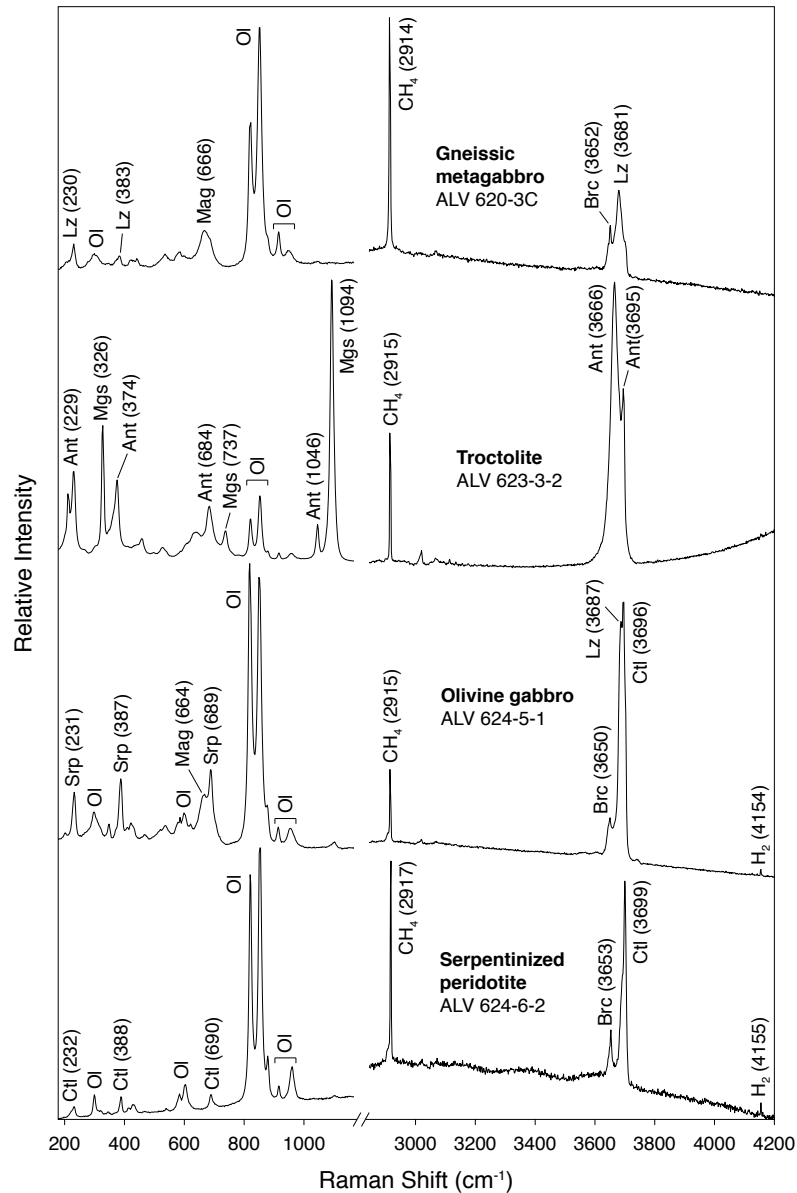
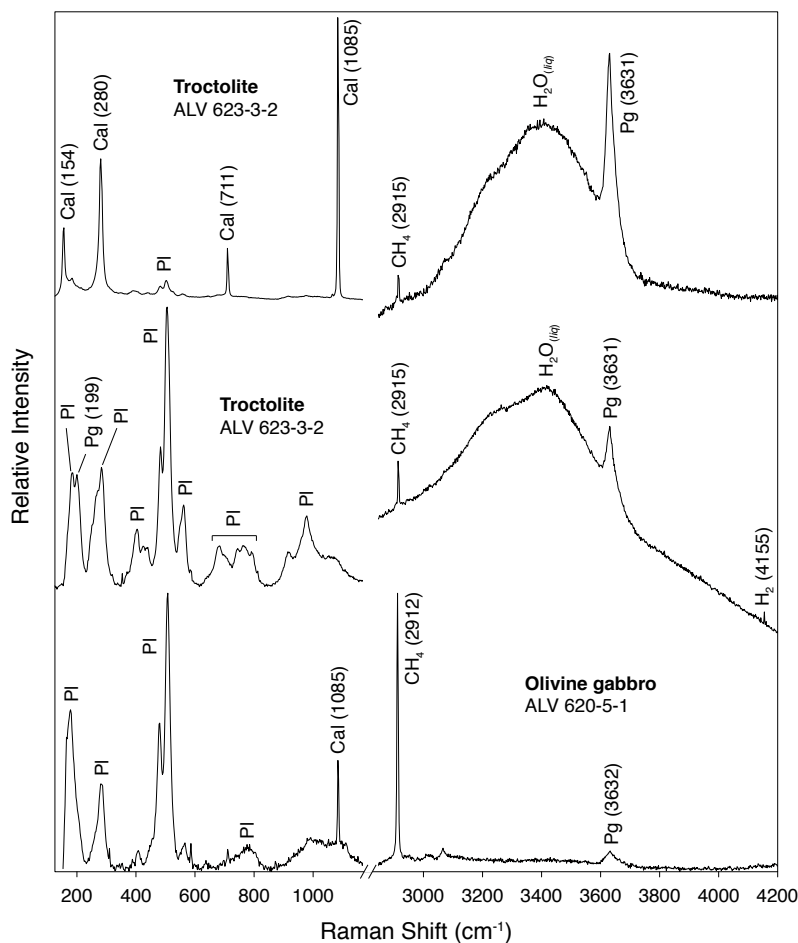


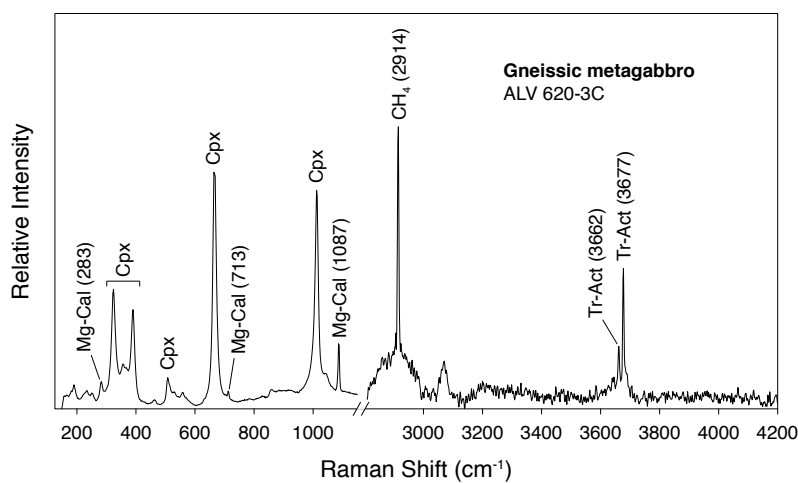
Chemical and isotopic analyses of hydrocarbon-bearing fluid inclusions in olivine-rich rocks



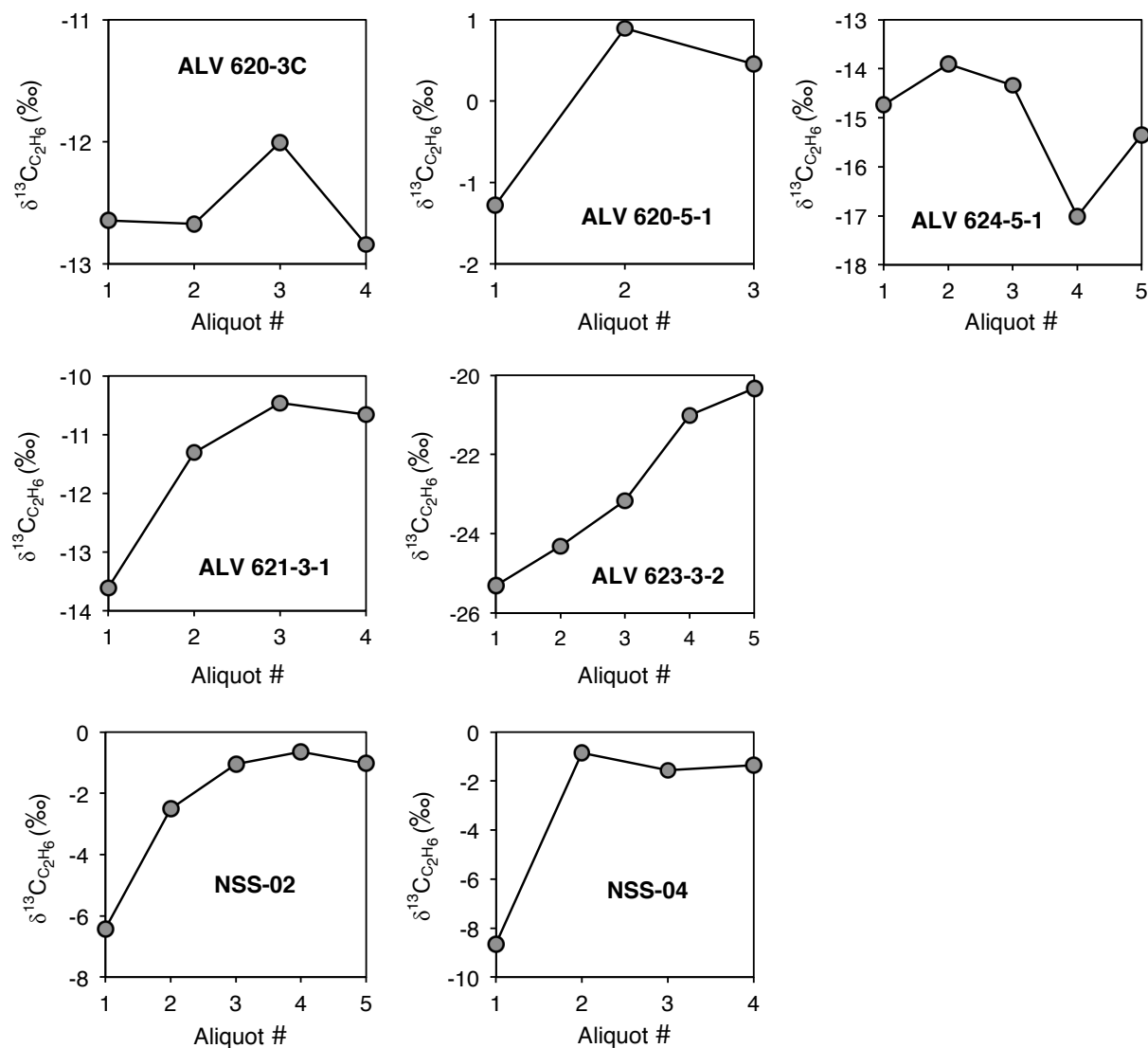
Supplemental Figure S1. Representative Raman spectra of olivine-hosted secondary fluid inclusions in samples from the Mid-Cayman Rise. Raman band positions for olivine are removed for clarity. Mineral abbreviations: Ant - antigorite, Brc - brucite, Ctl - chrysotile, Lz - lizardite, Mag - magnetite, Mgs - magnesite, Ol - olivine, Srp - serpentine.



Supplemental Figure S2. Representative Raman spectra of plagioclase-hosted secondary fluid inclusions in samples from the Mid-Cayman Rise. Raman band positions for plagioclase are removed for clarity. Mineral abbreviations: Cal - calcite, Pg - paragonite, PI - plagioclase.



Supplemental Figure S3. Representative Raman spectrum of a clinopyroxene-hosted secondary fluid inclusion in the gneissic metagabbro sample ALV 620-3C from the Mid-Cayman Rise. Raman band positions for clinopyroxene are removed for clarity. Mineral abbreviations: Cpx - clinopyroxene, Mg-Cal - Mg-calcite, Tr-Act - tremolite-actinolite.



Supplemental Figure S4. Plots showing the changes in $\delta^{13}\text{C}_{\text{C}_2\text{H}_6}$ values with replicate analyses of the same sample. Most samples from the Mid-Cayman Rise and Zambales ophiolite exhibit more ^{13}C -depleted C_2H_6 in the first sample aliquots, which may be attributed to the production of isotopically light C_2H_6 from the crushing device.

Supplementary Table S1.

Hydrocarbon abundances from blank measurements.

Blank material	CH_4		C_2H_6		$\text{CH}_4/\text{C}_2\text{H}_6$	
	Avg (nmol/g)	2σ	Avg (nmol/g)	2σ	Avg	2σ
Combusted Pyrex beads	0.07	0.03	0.0017	-	58	-
Combusted ALV 621-3-1	0.45	0.18	0.0007	0.0002	656	109
Combusted ALV 623-3-2	0.09	0.08	<i>bdl</i>			
Combusted ALV 624-3-3	0.04	0.05	<i>bdl</i>			

bdl – below detection limit