



Hydration of Deep Mantle Olivine

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McMurdo Volcanism



Salmon 2008

McMurdo Volcanism

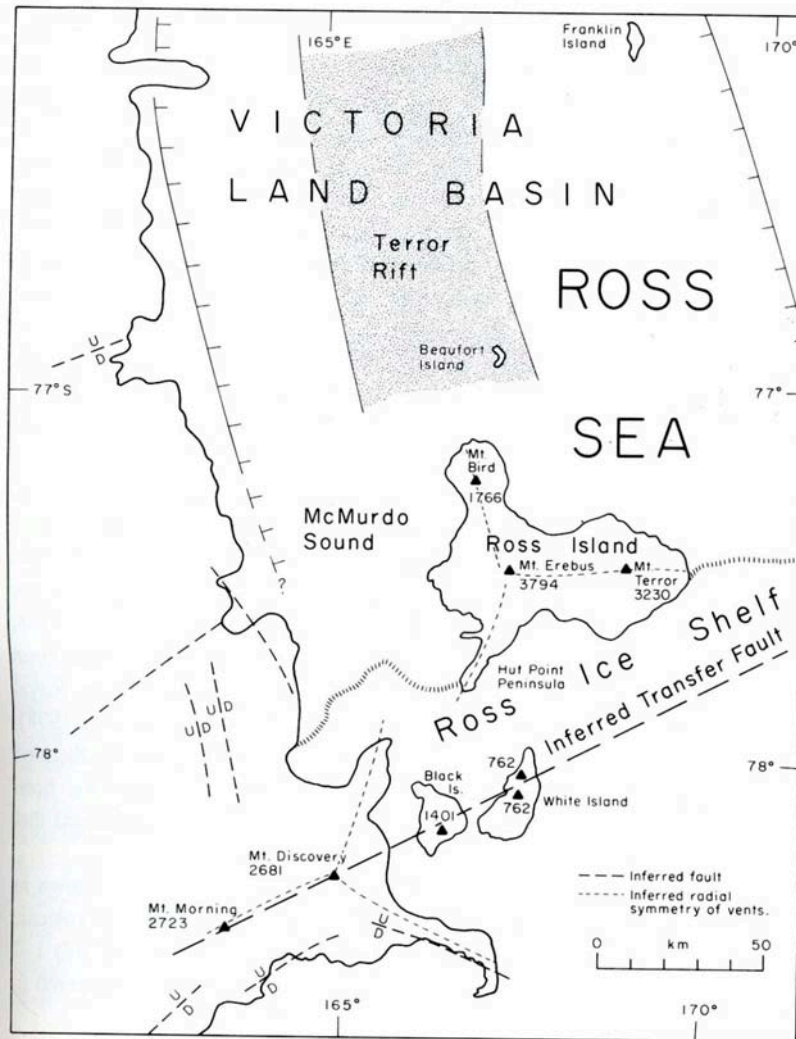
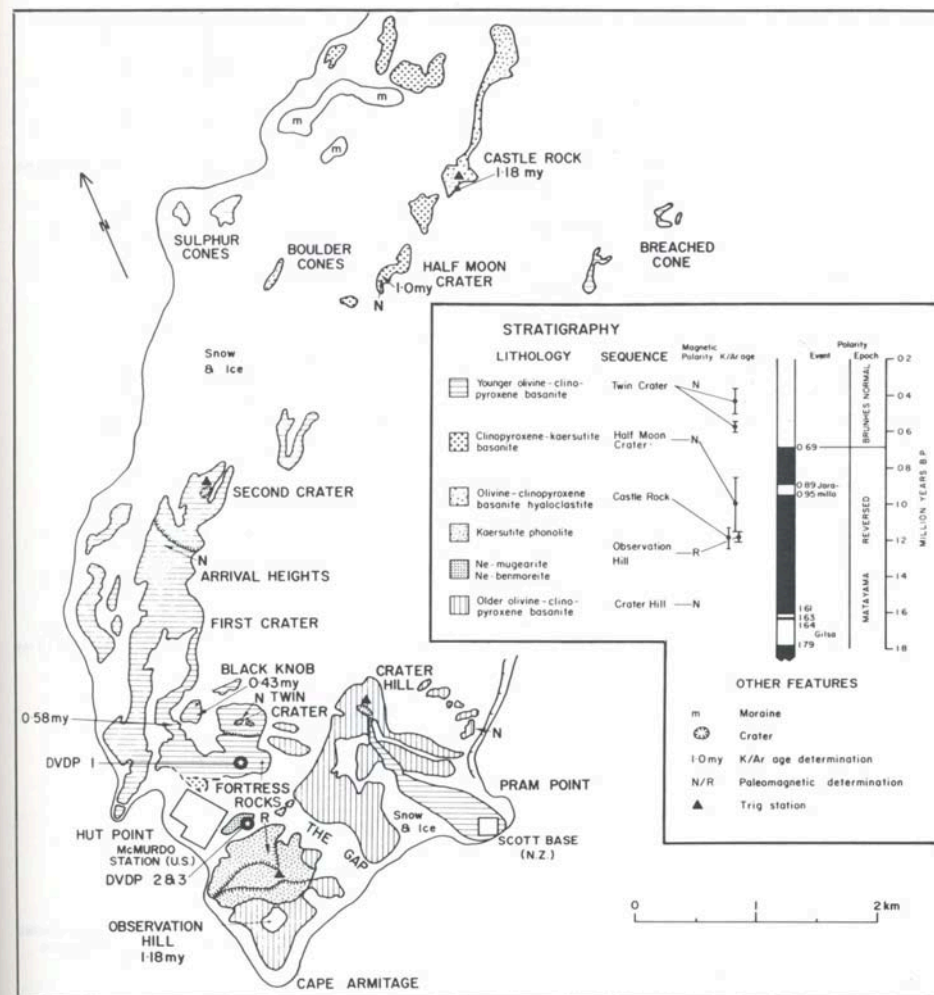


Fig. A.III.4. Generalized tectonic map of Erebus volcanic province, compiled from Warren [1969], Cooper et al. [1987], Wright-Grassham [1987], and Kyle (unpublished observations, 1987).

McMurdo Volcanism

Fig. A.18.1. Geologic sketch map of Hut Point Peninsula [from Kyle, 1981a].



McMurdo Volcanism

- **Rocks collected from Hut Point Peninsula**
- **Part of the Erebus Volcanic Province**
- **Most studied of the volcanic groups**
- **McMurdo Station located on Southern tip**

McMurdo Volcanism

- **Hut Pont Peninsula consists of an echelon line of volcanic cones trending SW from Mt. Erebus**
- **A large phonolite cone present**
- **K-Ar age ranges from 0.44 Ma to 1.34 Ma**
- **The rock sequence ranges from basalt to phonolite**
- **Alkali Basalts**

Olivine in the Mantle

- **In just the upper 410 km olivine could contain the volume of the ocean in water**
- **More pressure and temperature means more storage capacity**
- **Water source is believed to be subduction plates**
- **Would constitute a significant fraction of the total water budget of the planet**

FTIR

- **Fourier Transform Infrared Spectroscopy**
- **Infrared absorption creates a spectrum that can identify and quantify* chemicals present in a given sample**
- **Best way to measure water content in olivine**
- **Samples can be solid, liquid, or a gas**

FTIR



<http://www.bumc.bu.edu/biomedforensic/files//var/www/html/wp-content/blogs.dir/2596/files//2008/10/nicolet-6700-ftir-with-scope.jpg>

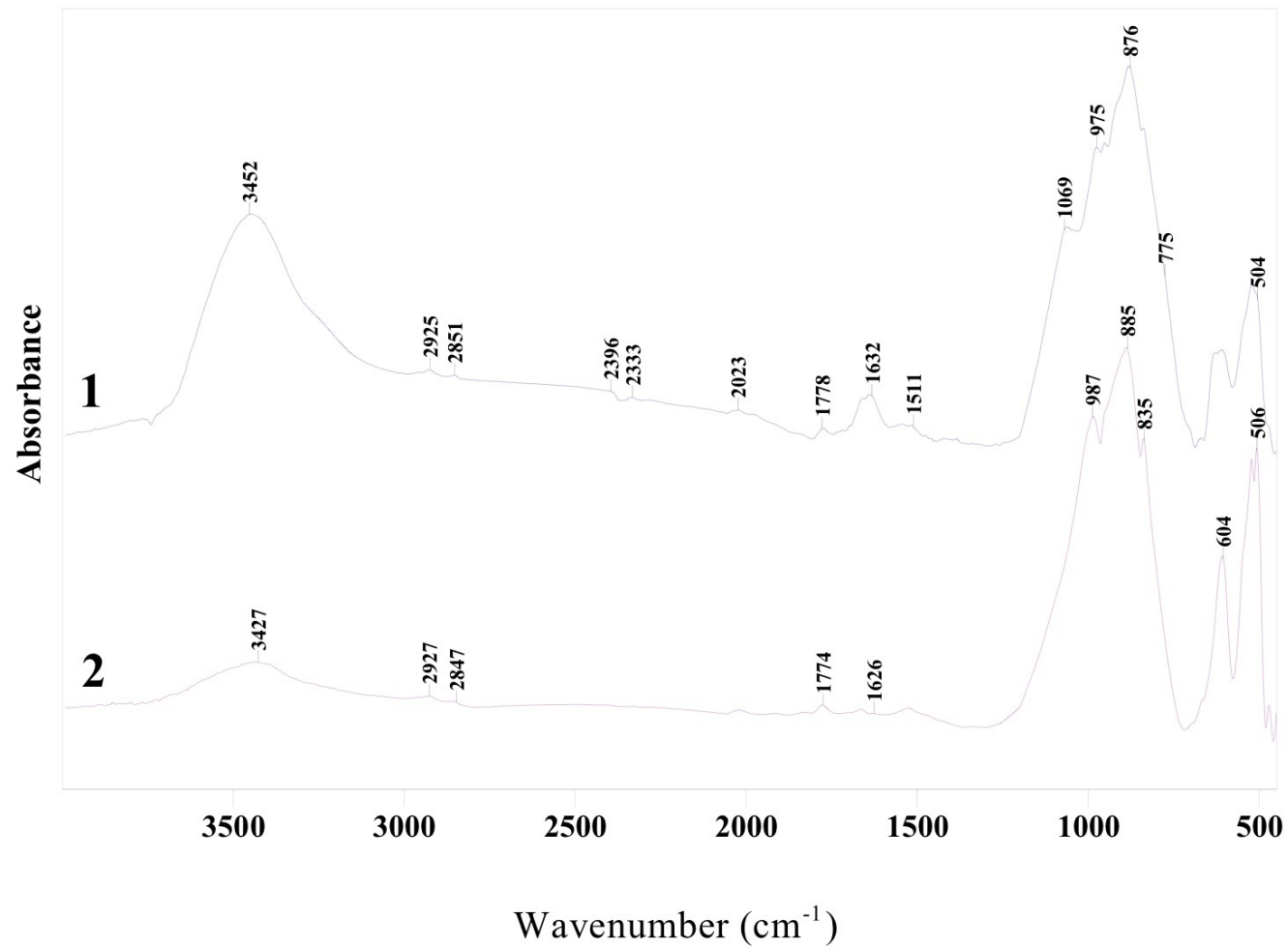
FTIR

- **The Five parts to FTIR**
- **The Source- Infrared energy**
- **The Interferometer - Coding the beam**
- **The Sample - Beam absorbed**
- **The Detector - Beam measured**
- **The Computer - Plots the data**
- **This all creates the Spectrum**

Data Collected

- **Sample 1 : McMurdo Xenolith**
- **Sample 2: South Beach Sand, Hawaii**
- **In region between 3500-3000 sample 1 is more intense than sample 2**
- **Sample 1 has more water present**
- **The bands 2925, 2927, 2947, 2951 are indicative of presence of some organics**

Data Collected



Conclusion

- **Both samples contain water**
- **Sample 1 seems to contain much more water**
- **Sample 1 \sim 4,500 ppm**
- **Sample 2 \sim 100 - 400 ppm**
- **Being able to quantify the amount of water would give us a picture of the formation conditions**

Work Cited

Kyle, P.R., 1990. McMurdo Volcanic Group Western Ross Embayment: Introduction In: "Volcanism of the Antarctic Plate and Southern Oceans" (Ed. W. LeMasurier, J. Thompson). Antarctic Research Series, Vol. 48., American Geophysical Union, 18-25.

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