Clementine
Bistatic Radar Experiment
(DPS 10.10-P)

Supplementary Press Material

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At Each Scattering Object
A Ray With A Single Direction Becomes A Cone Of Many Rays
Some Of The Scattered Rays Will Eventually Be Turned 180° & Exit The Medium
Volume Scattering
with
Total Internal Reflection
Peculiar Properties of Ice

1) Ice is very transparent — radio waves can propagate through pure ice for thousands of meters before dying out
2) As a result, small variations in ice density become important; refraction can change the direction of ray propagation before the wave is attenuated
3) Certain kinds of refractive scattering can be quite strong — particularly in the backward direction
4) Refractive scattering can also "preserve" the sense of circular polarization

How to Exploit These Properties?

1) Look for scattering regions that are brighter than expected
2) Look for scattering that is enhanced in the backward direction
3) Look for scattering with "unexpected" circular polarization properties

Clementine's Case

1) Low transmitter power makes this experiment 1000 times less sensitive than Earth-based experiments
2) Bistatic geometry allows measurements with varying angle β
3) Right-circularly polarized wave allows detection of polarization reversal
4) Staffing available, Project ready to go
EXPERIMENT GEOMETRY

TO EARTH

DSPSE

ICE

SIDE VIEW

EARTH VIEW
Orbital Geometrical Relationships:

- Lunar North Pole
- Lunar South Pole
- Tilt Relative To Sun
- 18:40 β=50
- 18:47 β=0
- 23.5°
- 1.6°
- ≈85°
Clementine CH1 = S-RCP 94/099 23:33-23:49

Fig. 2
Clementine Total (LCP-RCP)/(LCP+RCP) 94/099 23:33-23:49

Polarization Ratio

Minutes from Start

Fig 6
Latitude at 0° Longitude

94/100 01:16:25

RCP Echo Power vs. kHz from Direct Signal