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In-Flight Cross-Calibration of ASTER/TIR and MODIS-N

1. Purpose

- Improve Absolute Radiometric (Temperature) Accuracy of ASTER/TIR
  (particularly in the low temperature region)

2. In-Flight Calibration Targets

<Conditions>

1) Low Temperature
2) Spectrally Constant and High Emissivity
3) Spatially homogeneous
4) Smaller Atmospheric Effects (High elevation) low humidity)
5) Frequent visit by EOS-AM1

--> -Snow/ice Fields in Antarctica, Greenland
- Temperature < 220 K
- Snow Emissivity > 0.98
- Elevation > 3 km
- Homogeneity ????

-Top of Cumulonimbus

ORIGINAL PAGE IS OF POOR QUALITY

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3. Spectral Bandpasses (μm)

ASTER	MODIS-N
(10) 8.125-8.475	
	(29) 8.40-8.70
(11) 8.475-8.825	
(12) 8.925-9.275	
	(30) 9.58-9.88
(13) 10.25-10.95	
	(31) 10.78-11.28
(14) 10.95-11.65	

4. Error Sources

1) Co-location Error

2) Different Spatial Resolution: 90m vs. 1000m
   - Spatial Averaging Errors
   - Inhomogeneity of the Targets

3) Different Spectral Bandpasses
   - Inconstant Emissivity of the Targets
     Snow: > 10.5μm
   - Atmospheric Effects
     Transmittance

We don't have AIRS on EOS-AM1.
↓
MODIS-N, Atmospheric Model (LOWTRAN, Meteorological Researc
Institute's Mo

ASTER/TIR

-Ground Resolution: 90m

-Absolute Radiometric Accuracy Requirement:
200 K~240 K: ±3 K
240 K~270 K: ±2 K
270 K~340 K: ±1 K
340 K~370 K: ±2 K

-NEΔT: 0.3 K

-T...: 370 K

On-board Blackbody
270-340°K

MODIS-N

-Ground Resolution: 1000m
-Absolute Radiometric Accuracy Requirement: 1 %
-Typical Scene Temperature: (29) 300 K
(30) 250 K
(31) 300 K

-NEΔT: (29) 0.05 K
(30) 0.25 K
(31) 0.05 K

-T...: (29) 324 K
(30) 275 K
(31) 400 K

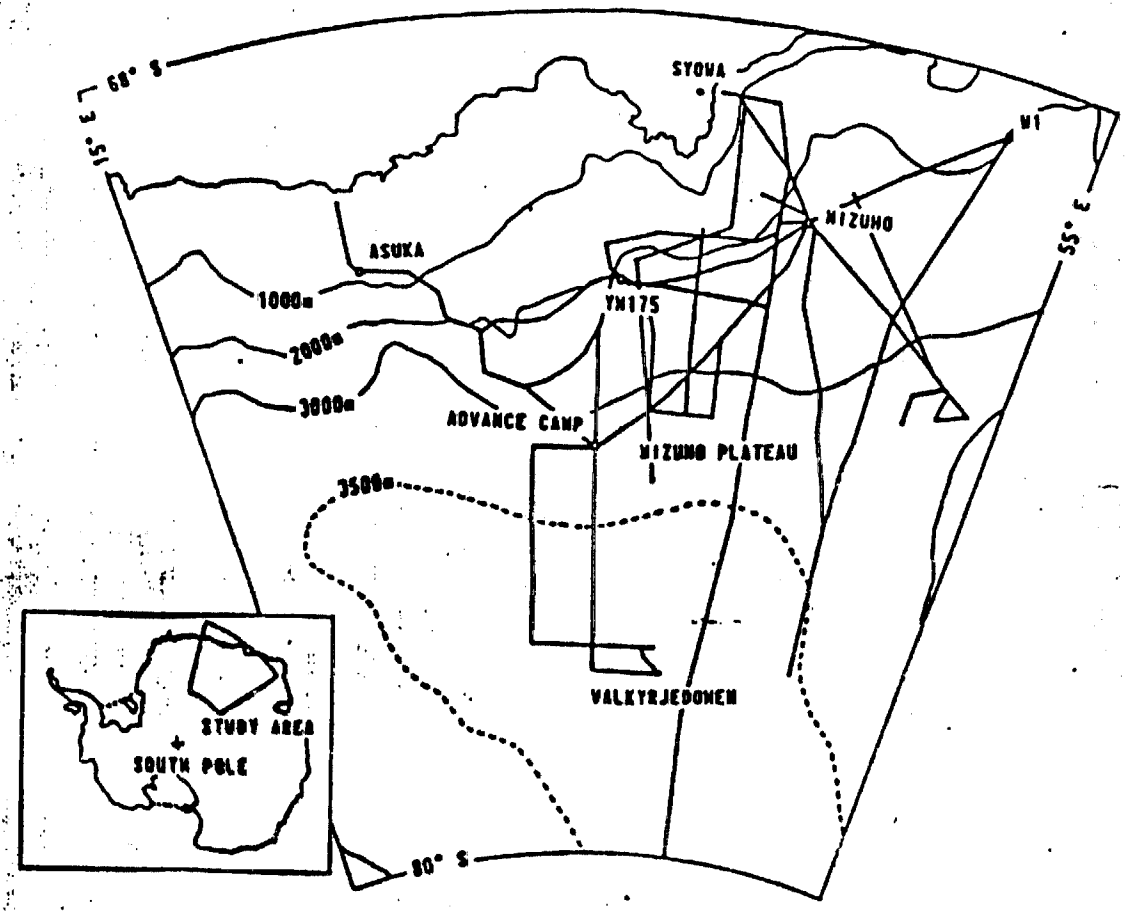

Figure 1. Map of study area and JARE traverse routes (1963–1987).

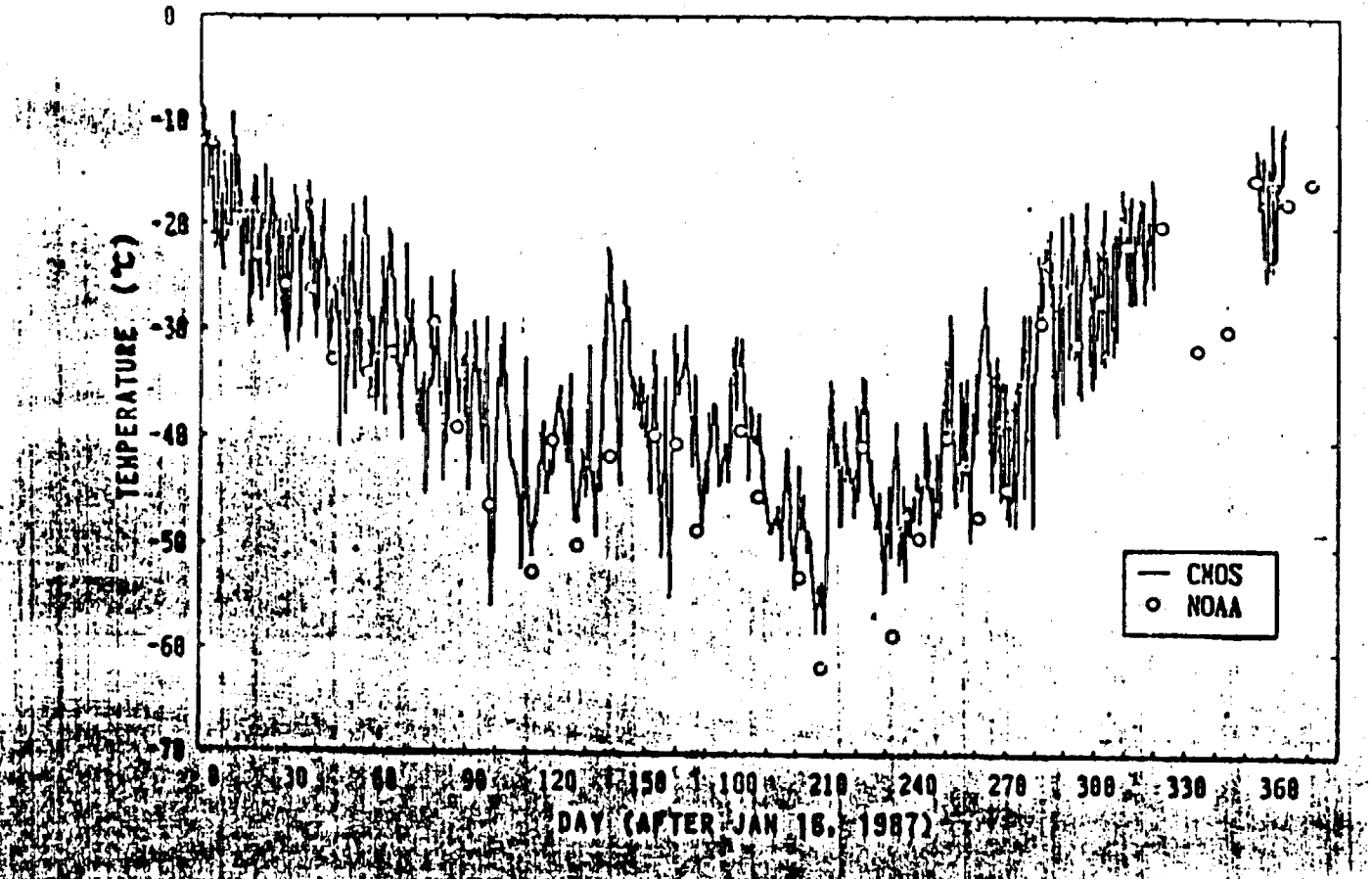

Figure 3. Air and brightness temperatures as measured by automatic weather recorder (CMOS) and by NOAA channel 5 thermal infrared radiometer, respectively.

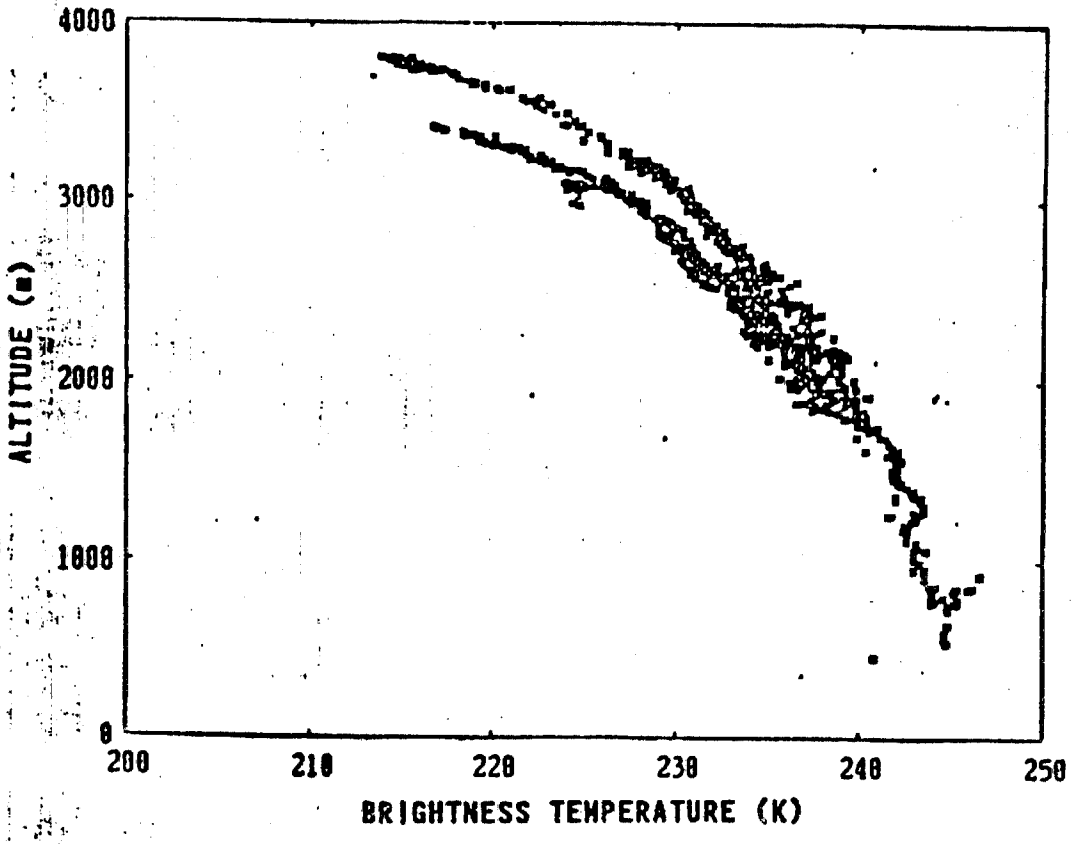

Figure 6. Average NOAA channel 5 brightness temperature plotted against the altitude of the traverse stations on the ice sheet.

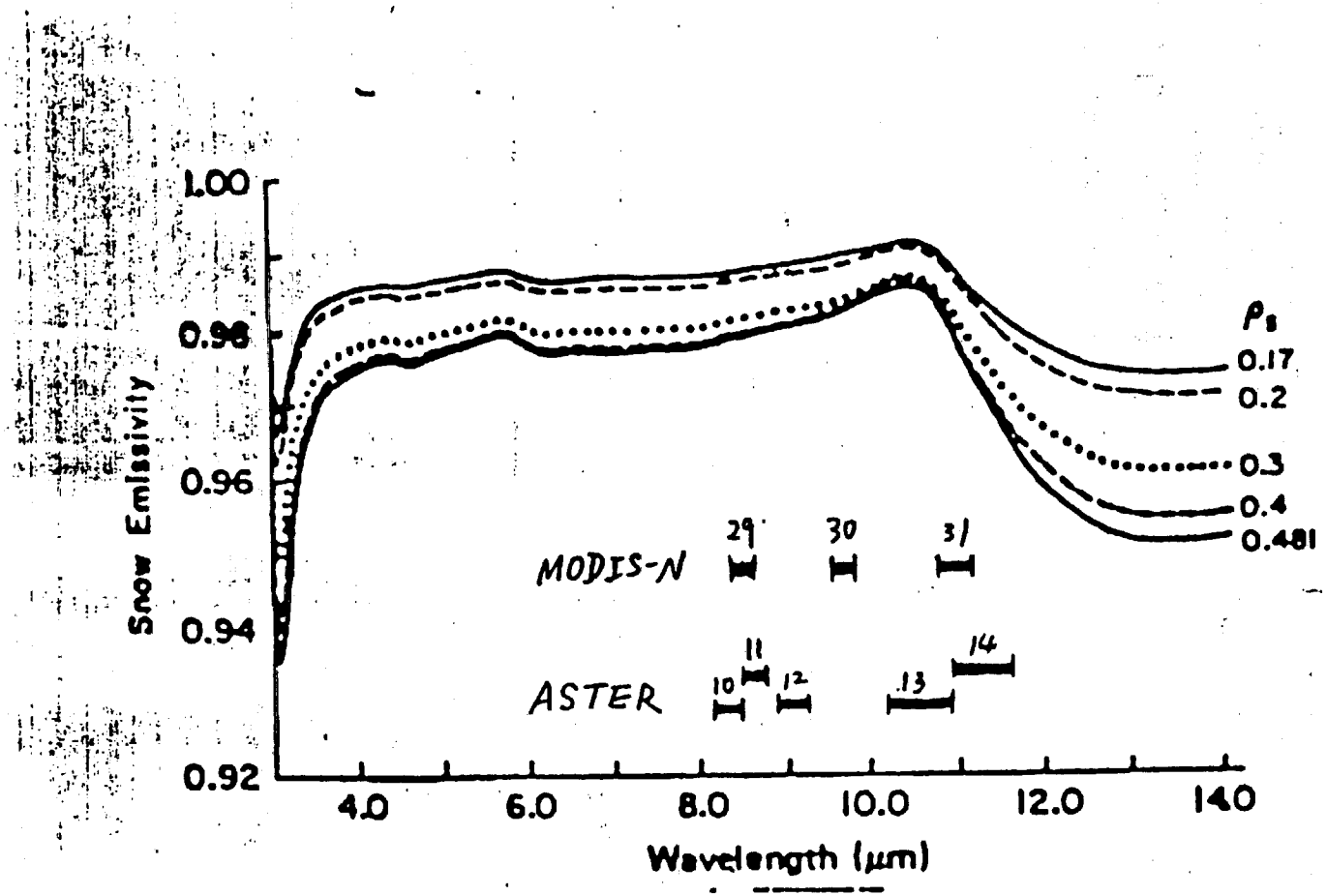

Fig. 17. Emissivity as a function of wavelength for various snow densities, according to the model of *Berger* [1979]. (Figure 7 of *Berger* [1979].)

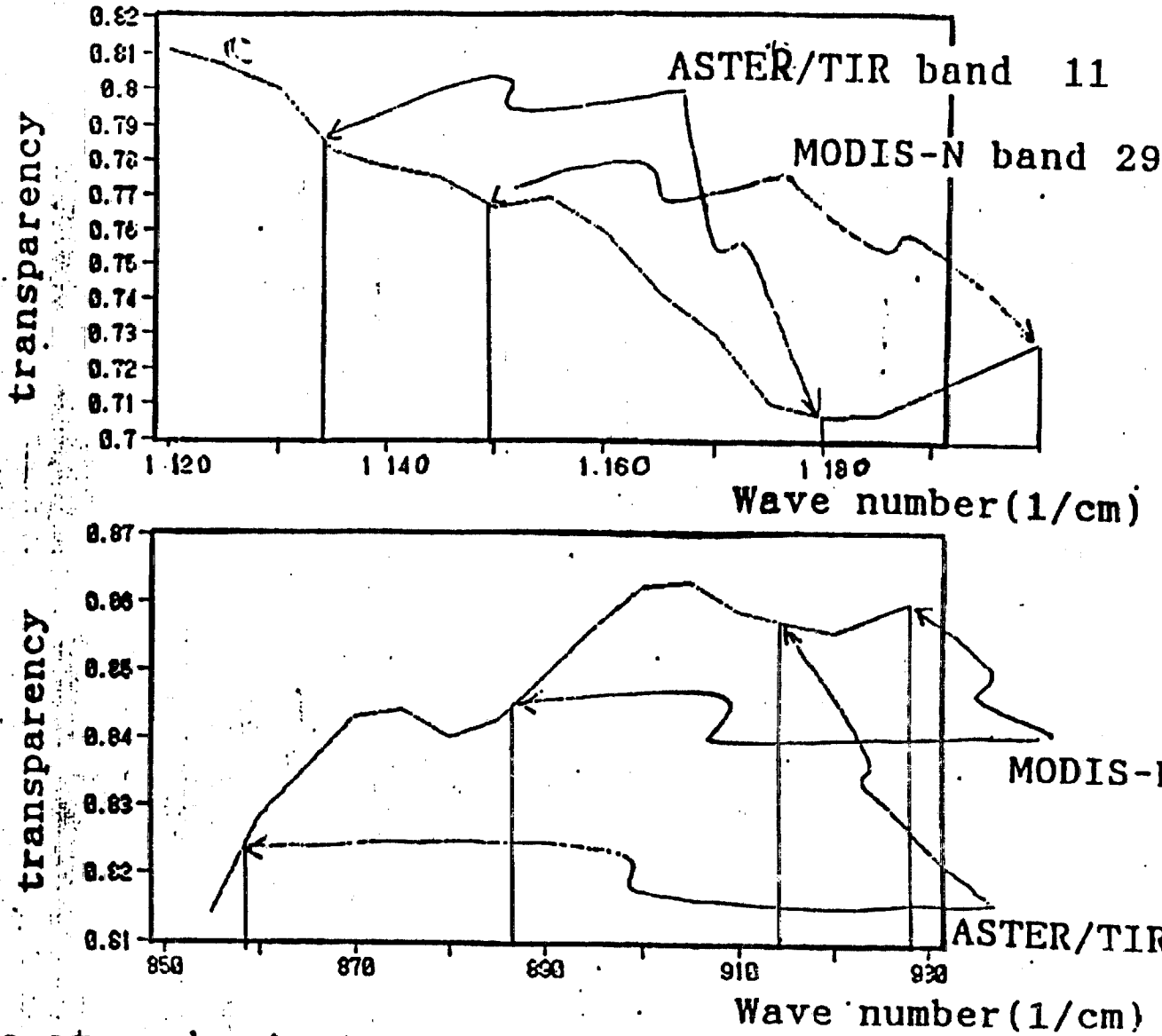

Fig.1 The atmospheric transparencies for ASTER/TIR band 11 and MODIS-N band 29 and ASTER/TIR band 14 and MODIS-N band 31