

Chinese Report to WGCV#21

**Presentation to CEOS WGCV # 21
Friendship Hotel, Beijing, China
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Beijing, China**

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1 SZ – 4 (Dec.29,2002)

2 FY – 3 (Scheduled 2005)

3 Moon exploration

4 Other sensor development

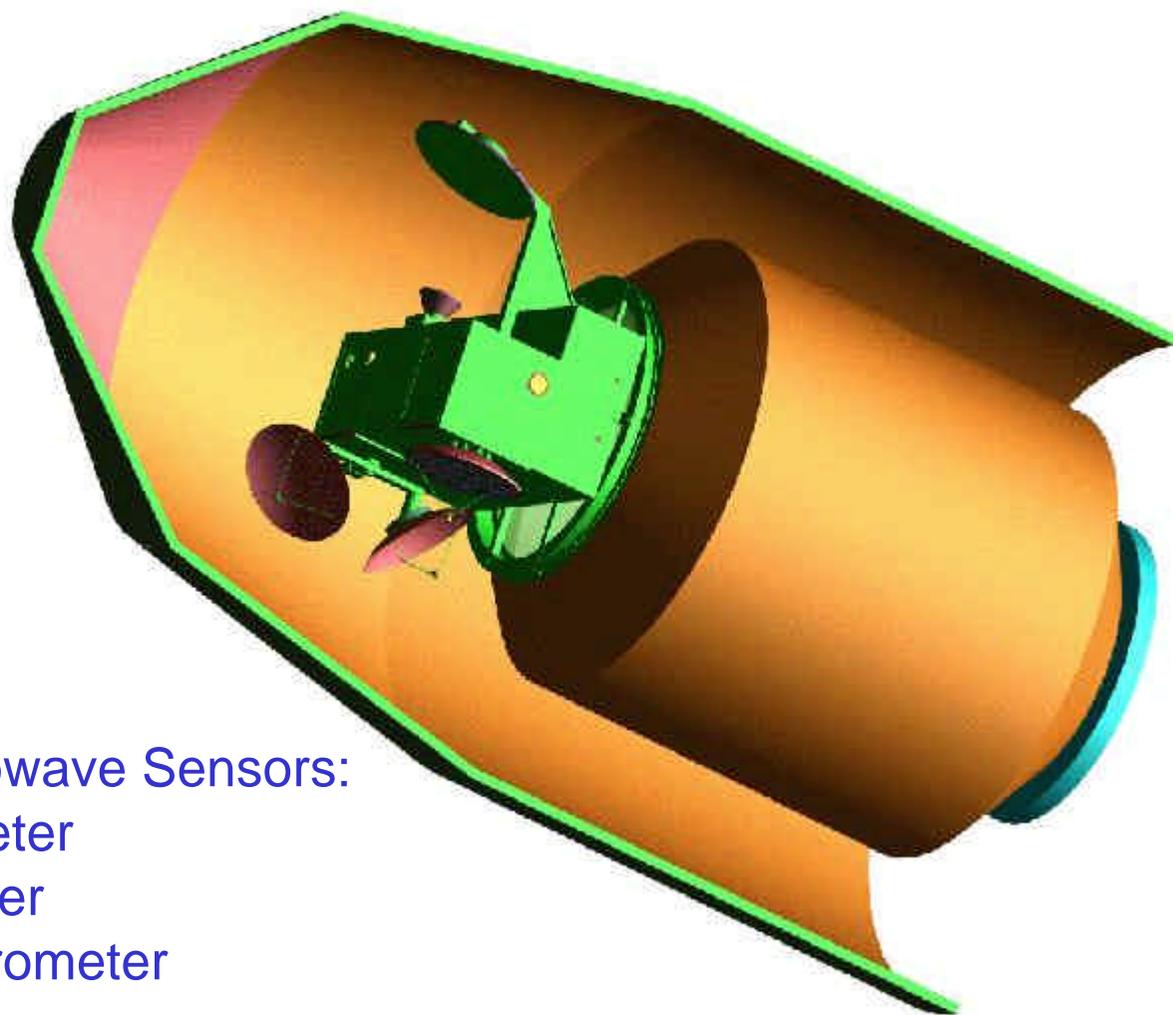
1. SZ-4 Chinese unmanned spacecraft was launched by Long March-II F Rocket on December 30, 2002





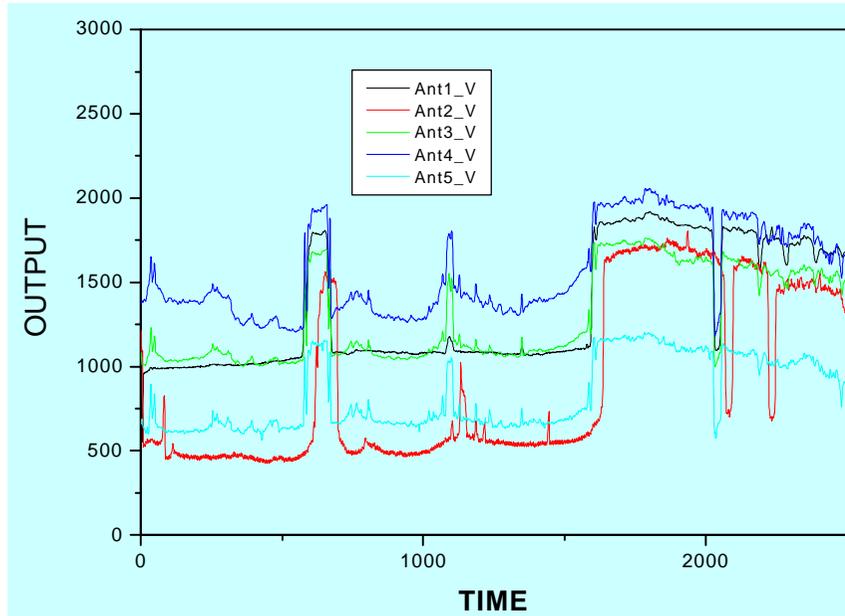
SN-4 多模态微波遥感器

「中国首次进入太空的微波遥感器」



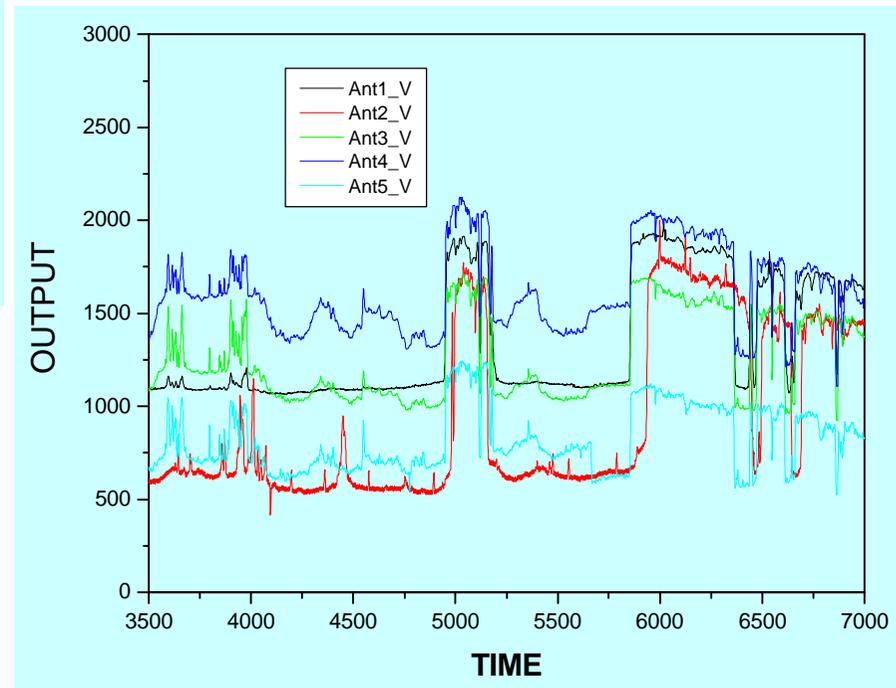
Multimode Microwave Sensors:
5-Band Radiometer
Ku-Band Altimeter
Ku-Band Scatterometer

SZ-4



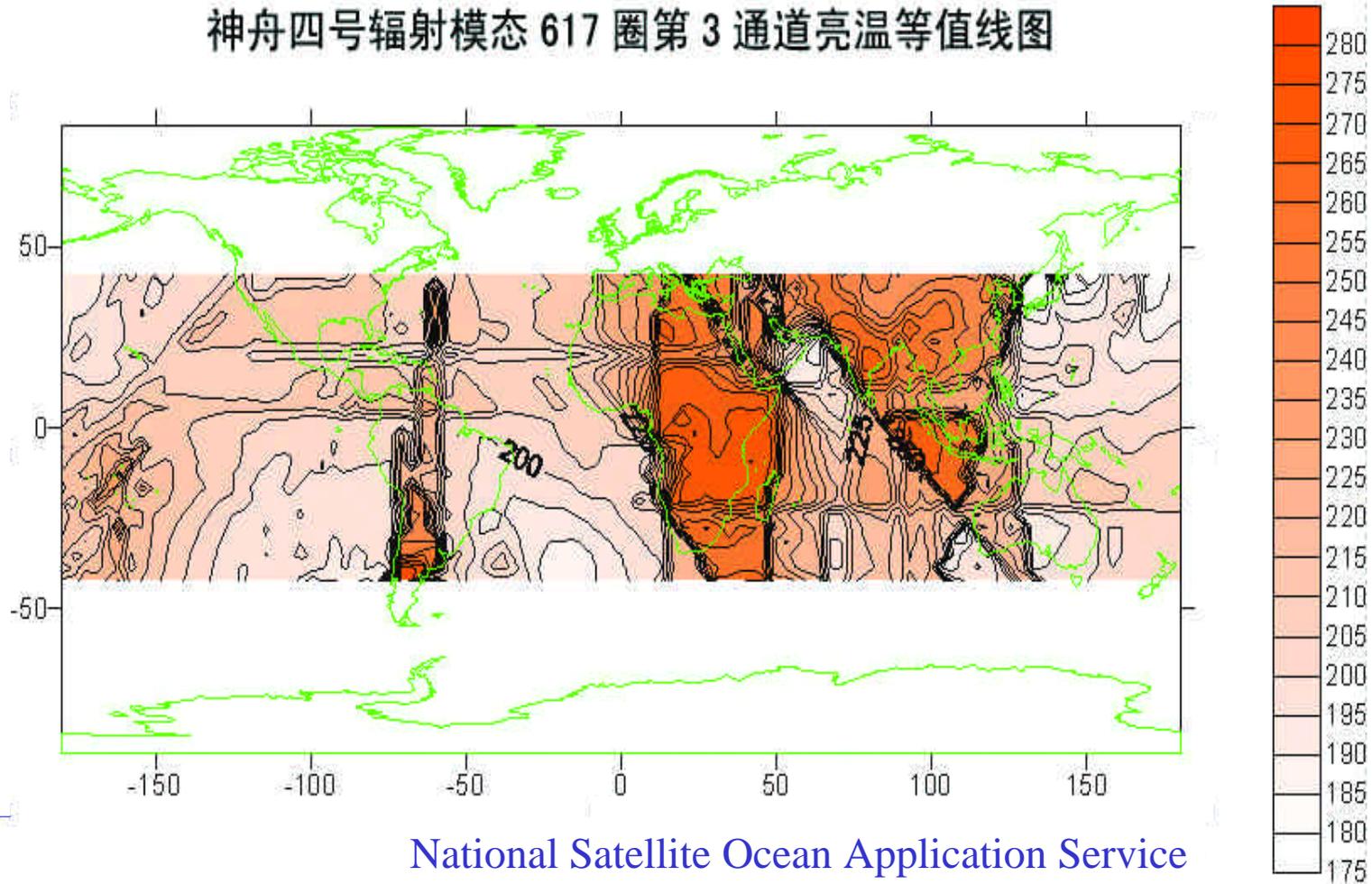
12-bit A/D Raw data

5-Band Microwave Radiometer: 6.6, 13.9, 19.35, 23.8, 37 GHz



SZ-4

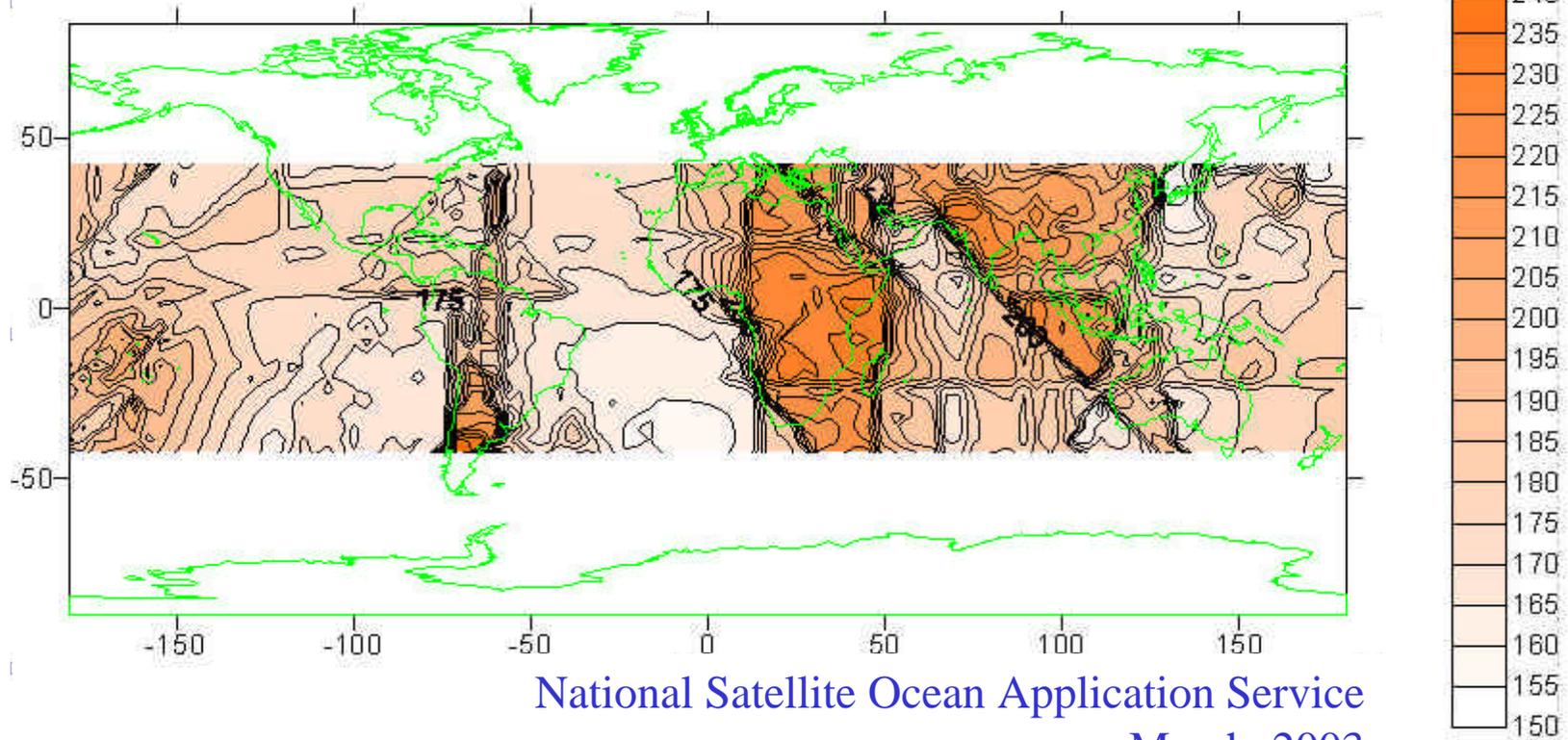
神舟四号辐射模式 617 圈第 3 通道亮温等值线图



National Satellite Ocean Application Service
March, 2003

SZ-4

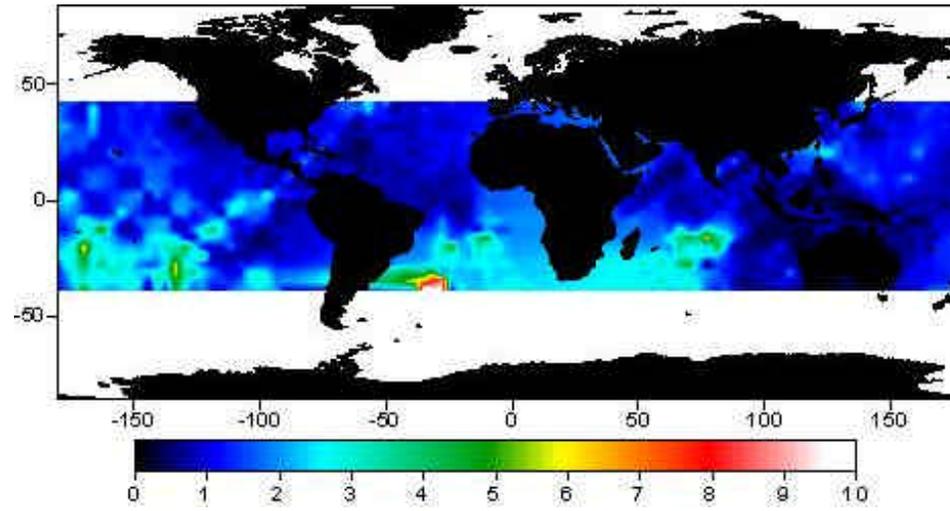
神舟四号辐射模式 617 圈第 5 通道亮温等值线图



National Satellite Ocean Application Service
March, 2003

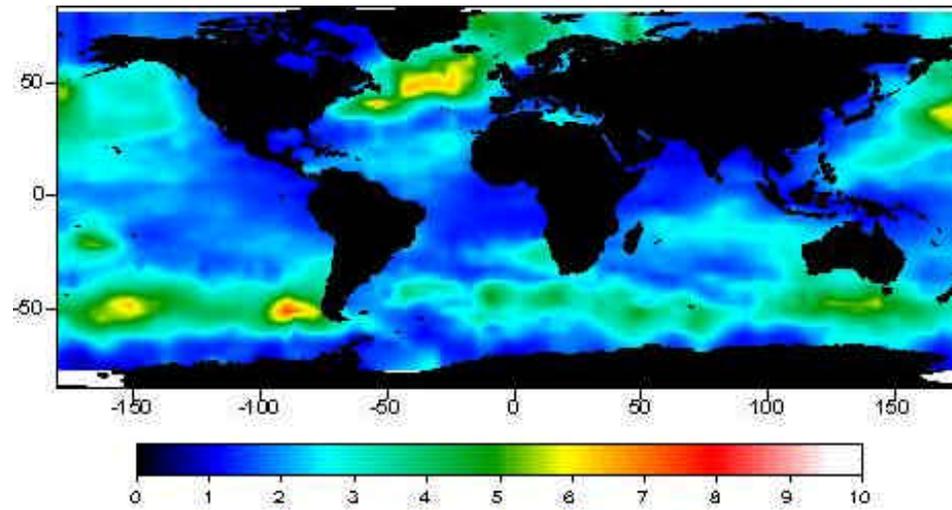
SZ-4

SZ-4 Altimeter



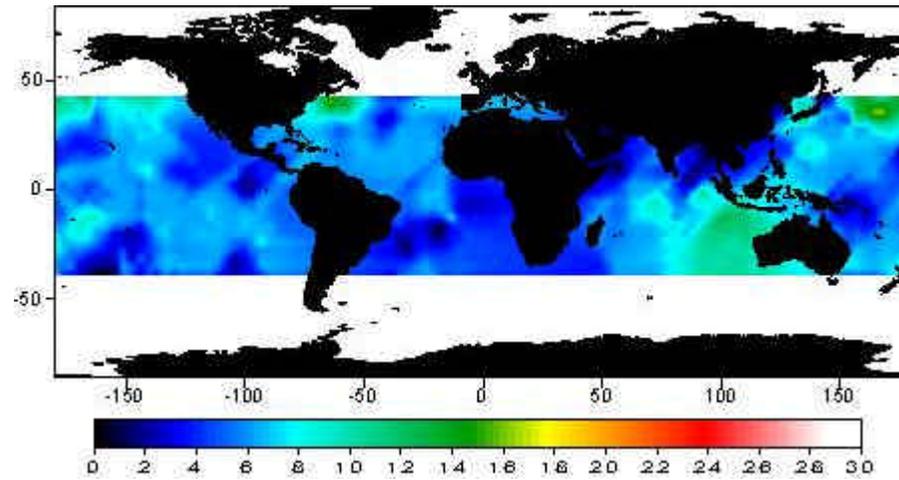
SWH

ERS-2 Altimeter



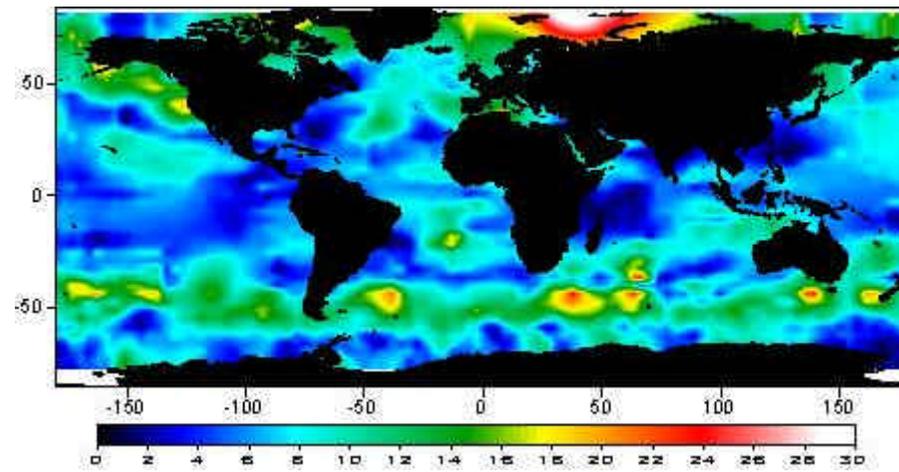
SZ-4

SZ-4 Altimeter



Sea surface
wind velocity

ERS-2 Altimeter

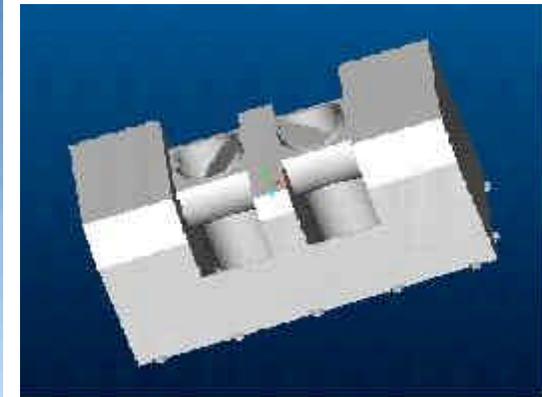




2. FY-3 Meteorological Satellite



MHS



China's second generation polar-orbit meteorological satellite with totally eleven instruments, three of which are microwave sensors, i.e.
Microwave Humidity Sounder (MHS, 150, 183GHz, CSSAR)
Microwave Temperature Sounder (MTS, 50.31, 53.74, 54.96, 57.95GHz, 504, CAST)
Microwave Radiation Imager (MRI, 10.65, 18.7, 23.8, 36.5, 89GHz, SITC)

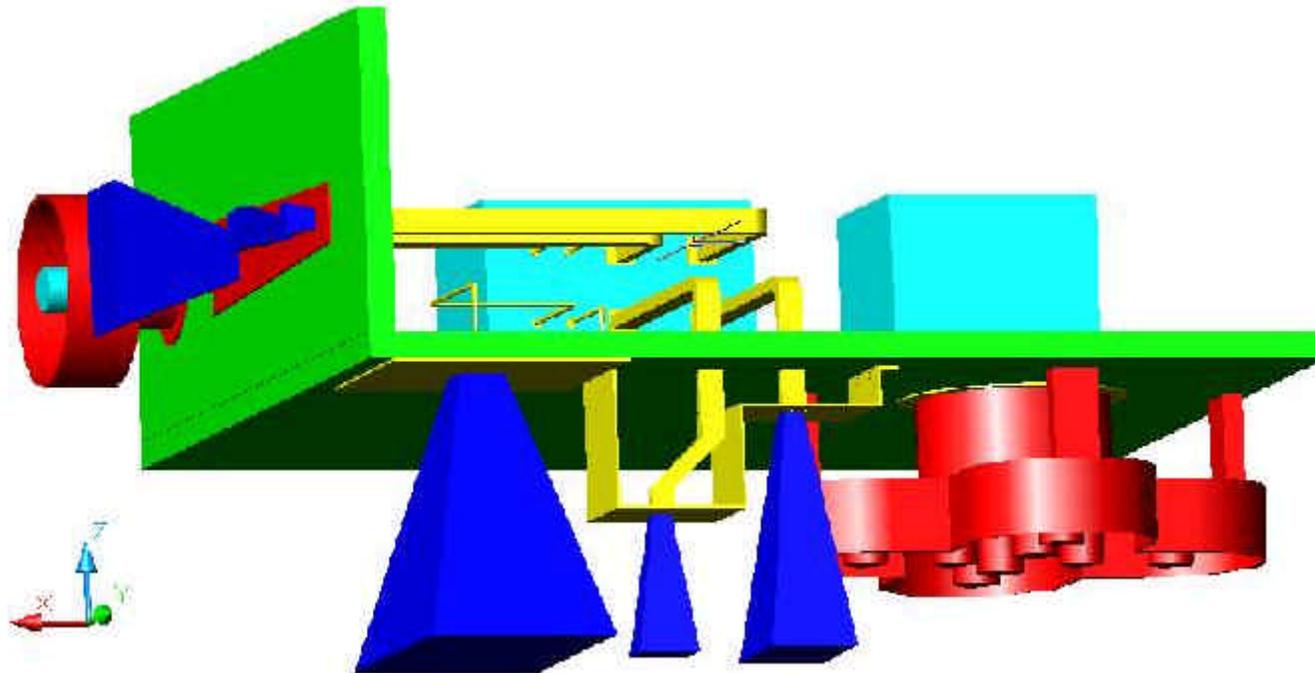
FY-3

Technical Specifications for MHS

Ctr. Freq (GHz)	Absorbing	Pol	Main Beam efficiency	Range (K)	BW (MHz)	Sensitivity(K)	Cal Acc (K)
150	Window	V	>95%	3~340	2000	0.9	1.5
150	Window	H	>95%	3~340	2000	0.9	1.5
183± 1	H₂O	H	>95%	3~340	500	0.9	1.5
183± 3	H₂O	H	>95%	3~340	1000	0.9	1.5
183± 7	H₂O	H	>95%	3~340	2000	0.9	1.5

3. Moon Exploration: Multiband Radiometer (3.0, 7.8, 19.35, 37GHz)

Objective: Investigate the components of
the Surface layer of the Moon



4. (1) China Imaging Altimeter (CIALT) (SPIE vol.4894,2003)



CIALT system

Flight experiment



System parameters

frequency	13.9 GHz	Bandwidth	110MHz
polarization	VV	Sampling rate	200MHz, 8bit
PRF	500 ~ 1200 Hz	Pulse duration	8μs
speed	80 ~ 100m/s	Swath	300 ~ 800 m
height	1500 ~ 2500 m	Resolution	2.5m
Squint angle	90°	Attenuator	0 ~ 63dB
Incident angle	25° ~ 44°	Peak power	5W
Antenna size	0.76m \times 0.20m	Position system	DGPS
Antenna gain	27dB		
baseline	1m		
Baseline angle	0° ~ 20°		

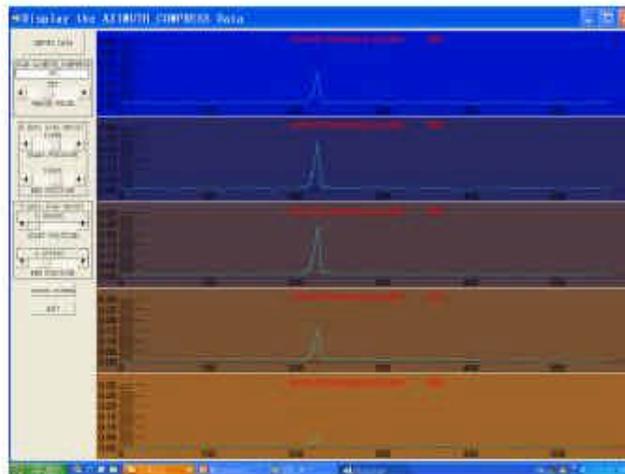
Flight Experiment

Resolution analysis: $2.5\text{m} \times 2.5\text{m}$

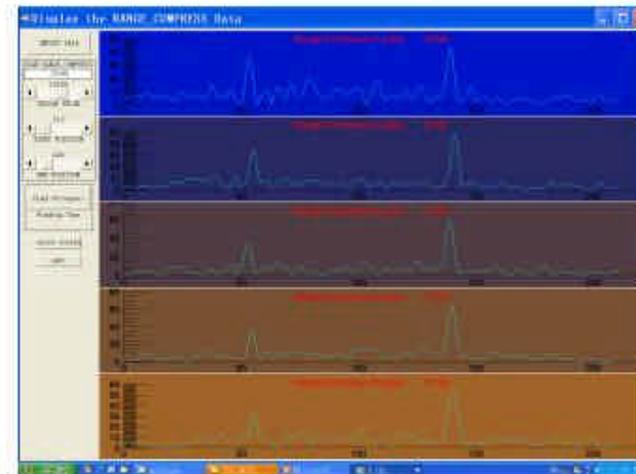
Standard
corner reflector



Combined
corner reflector

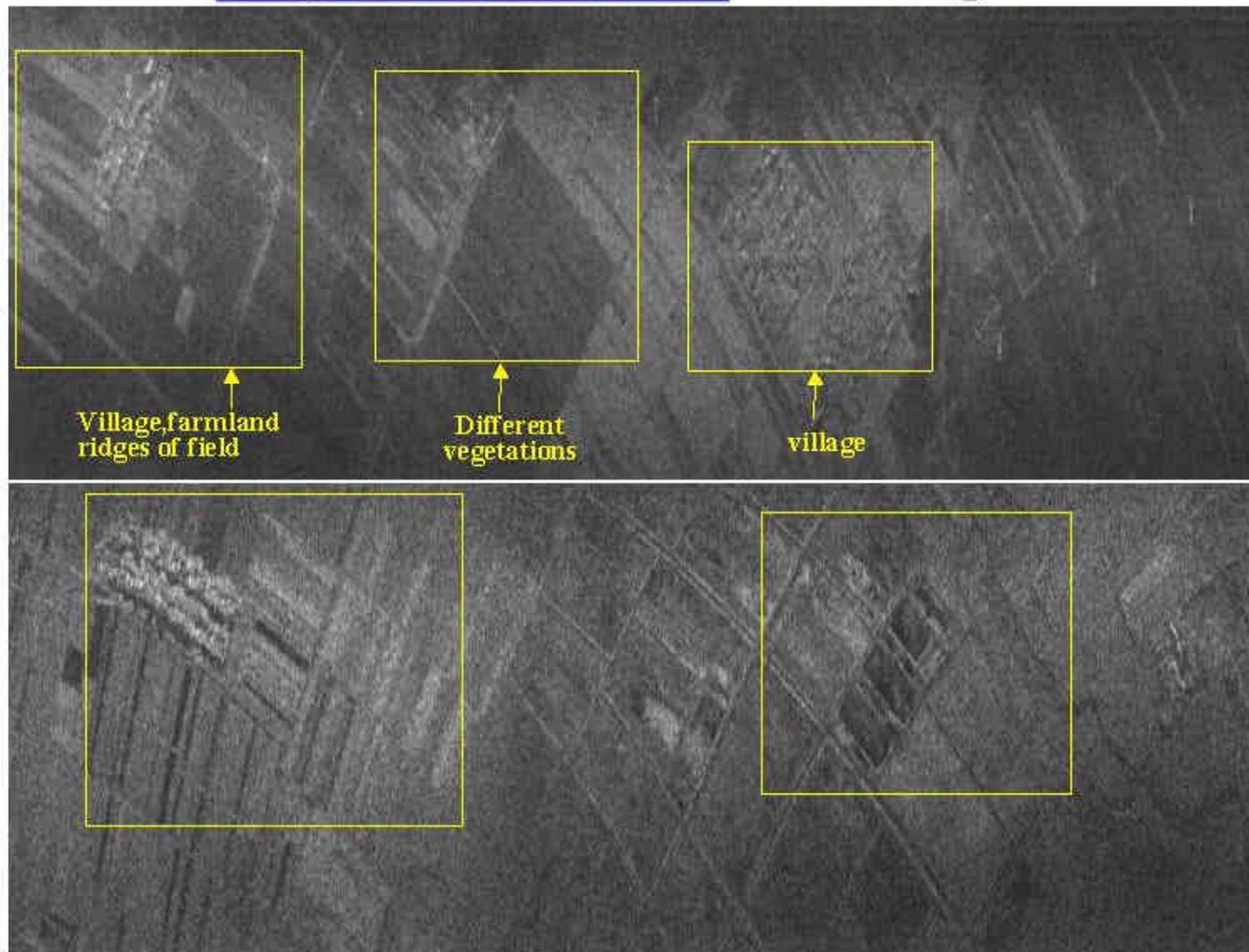


Response of point target in azimuthal direction

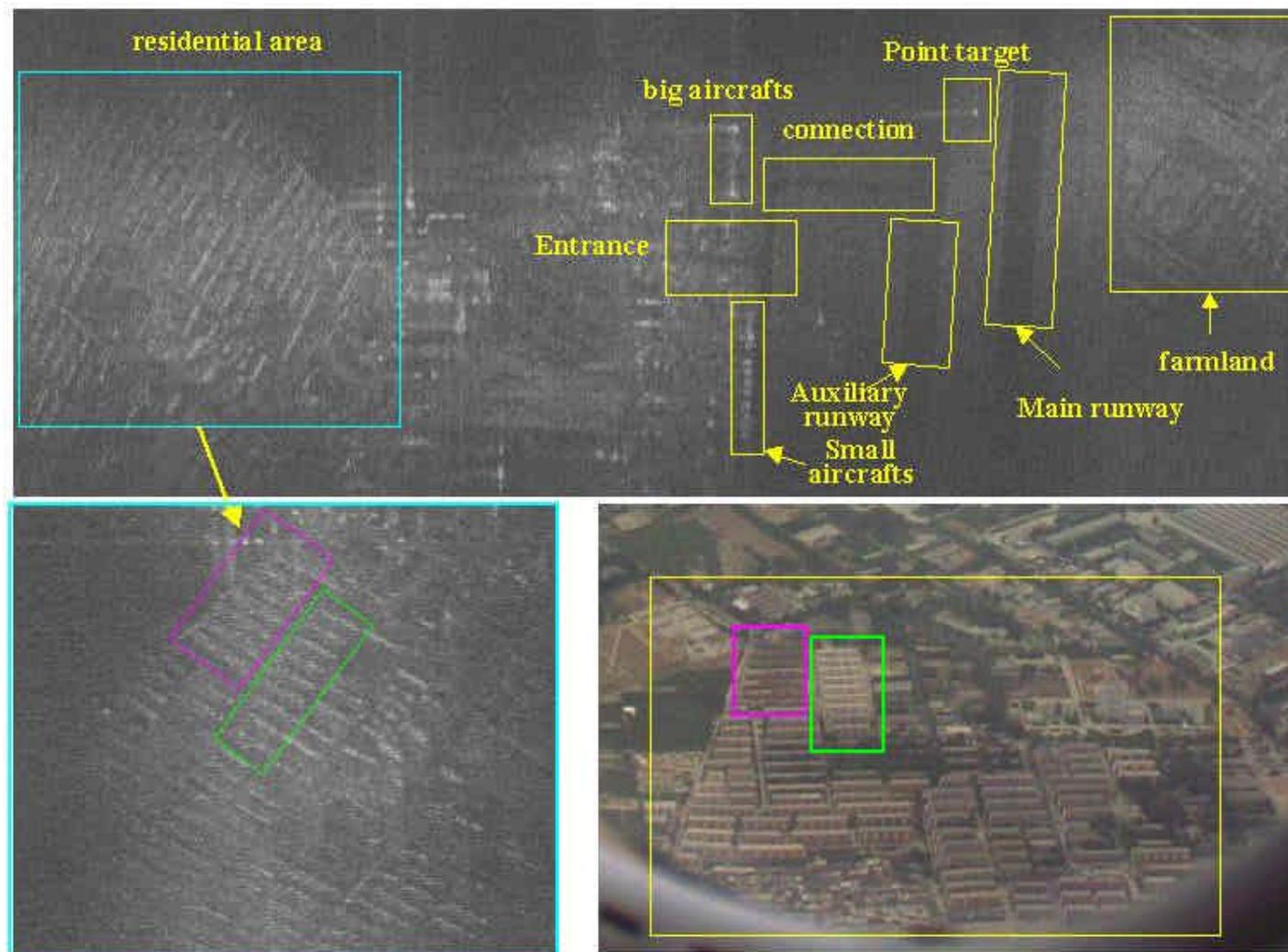


Response of point target in range direction

Flight Experiment : 2D images



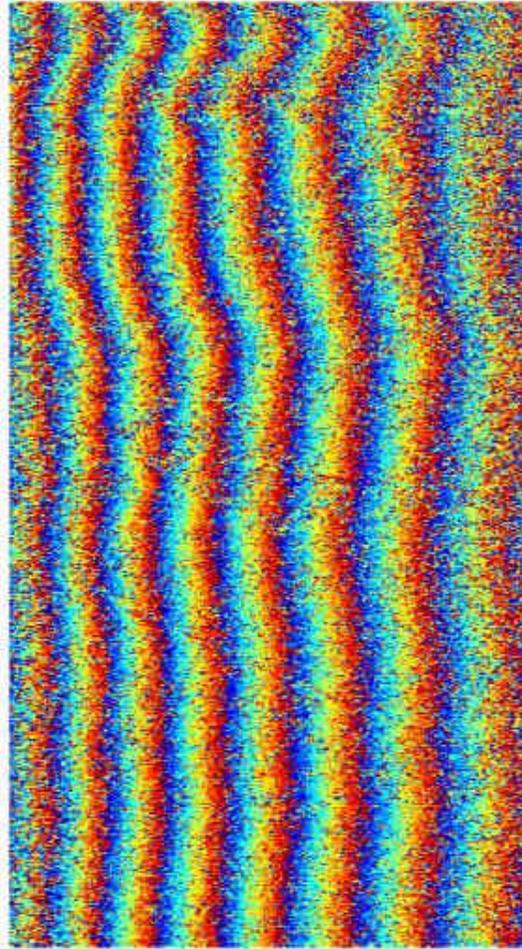
Flight Experiment : 2D images



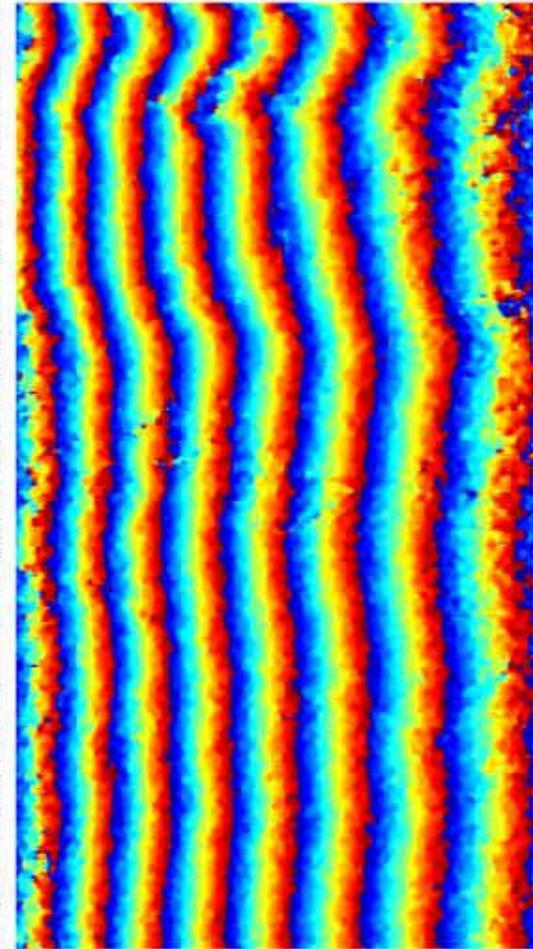
Flight Experiment : 3D images



Amplitude image

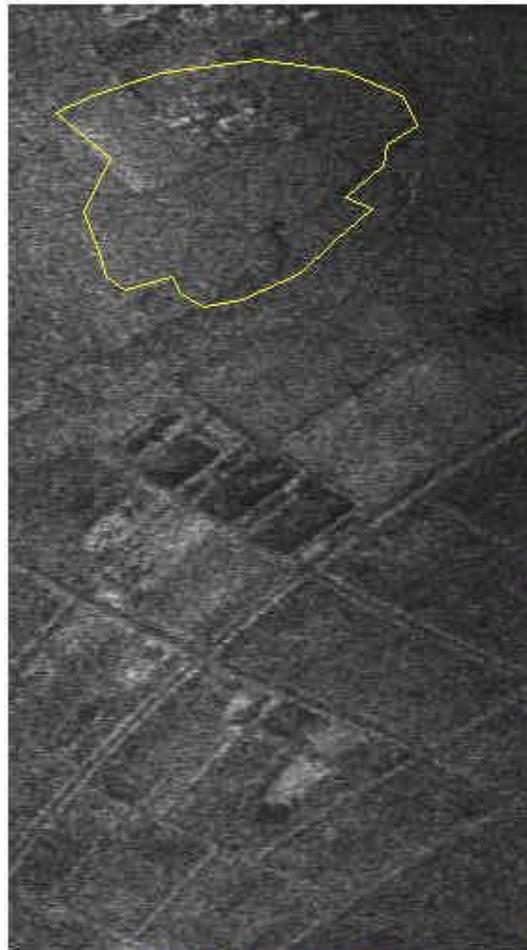


Interferogram by
direct estimation

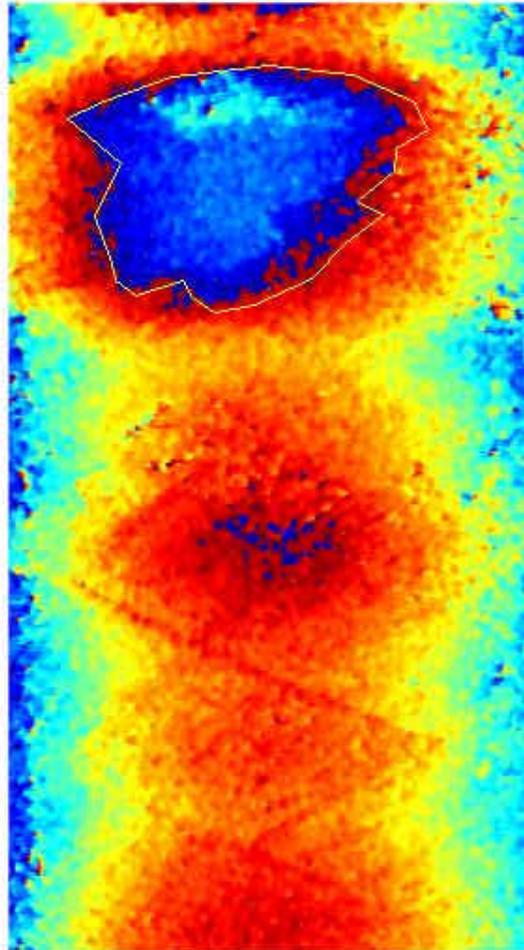


Interferogram by
Maximum-likelihood estimation

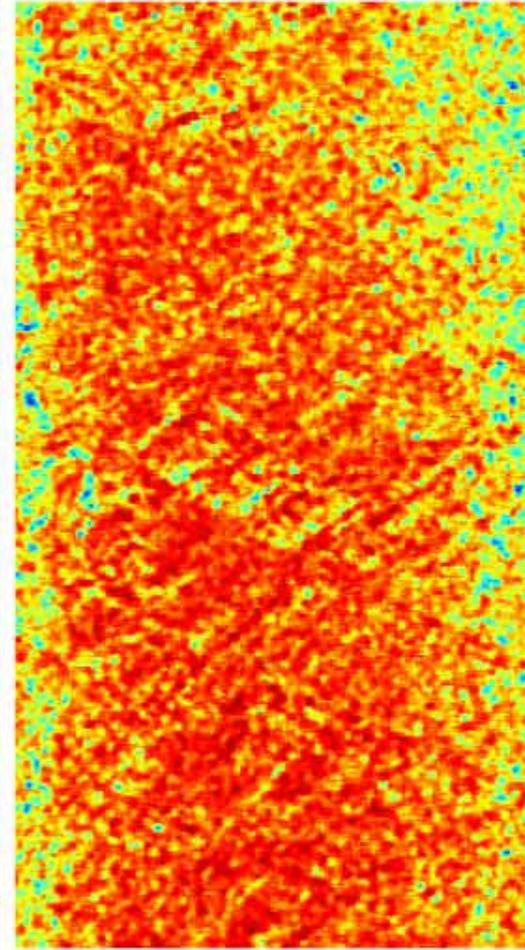
Flight Experiment : 3D images



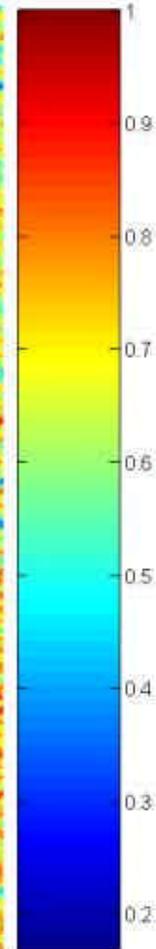
Amplitude image



Interferogram with
flat-earth-effect removed



Coherent image

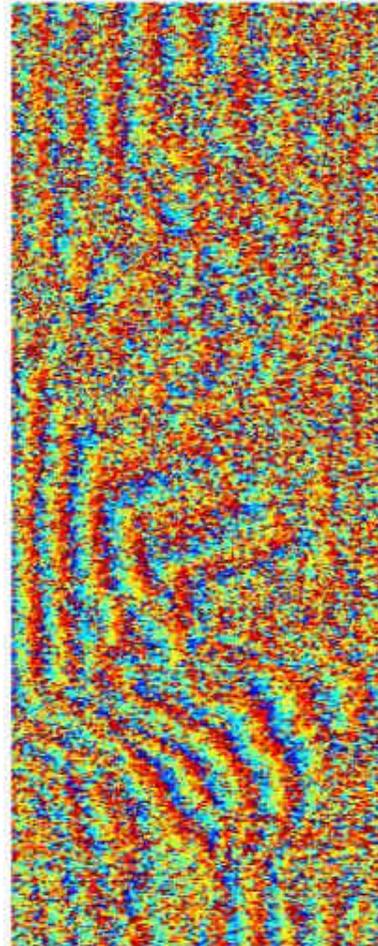


Flight Experiment : 3D images

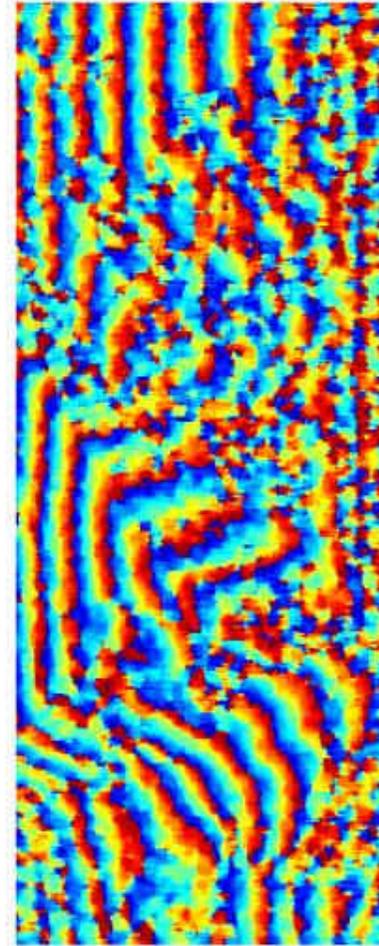
05/11/03



Amplitude image

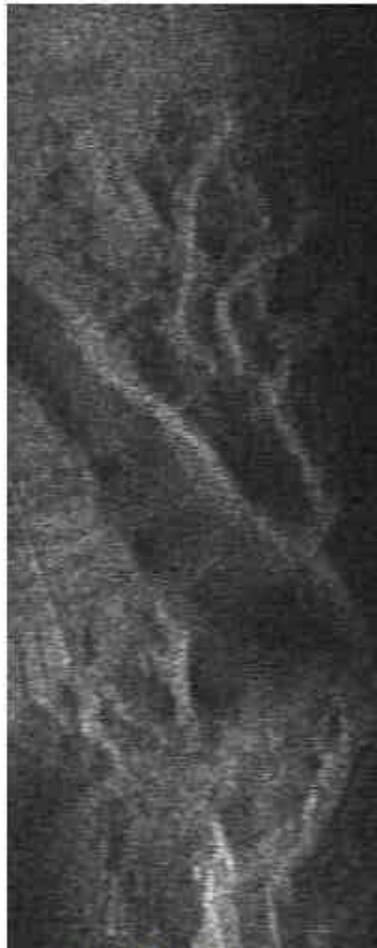


Interferogram by
direct estimation

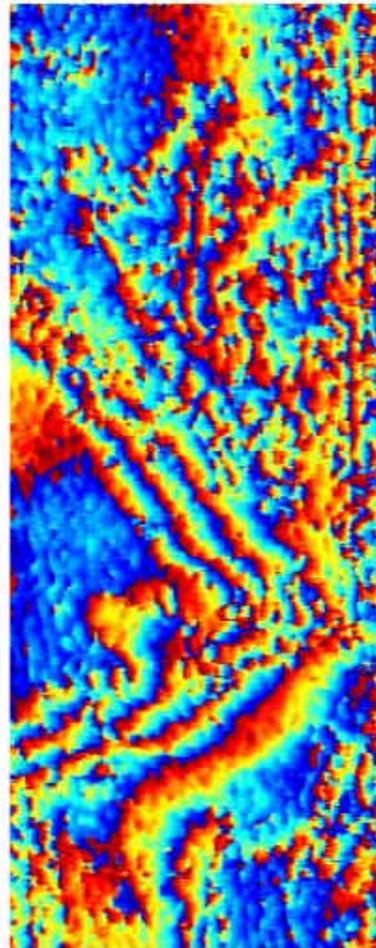


Interferogram by
Maximum-likelihood estimation

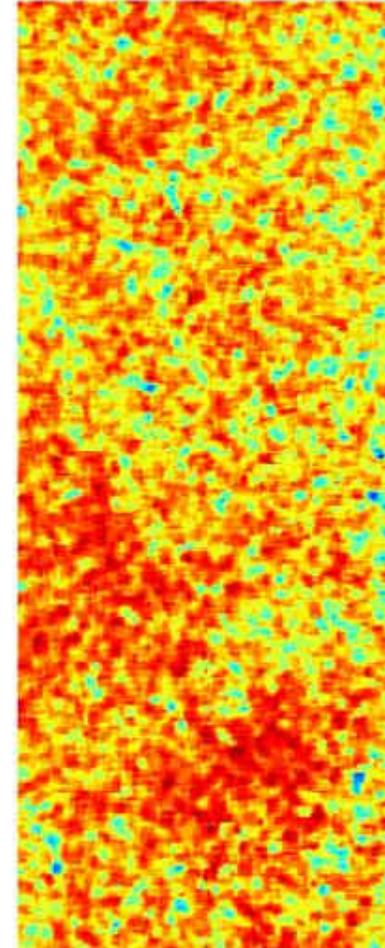
Flight Experiment : 3D images



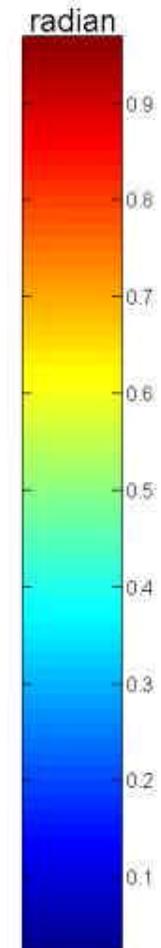
Amplitude image

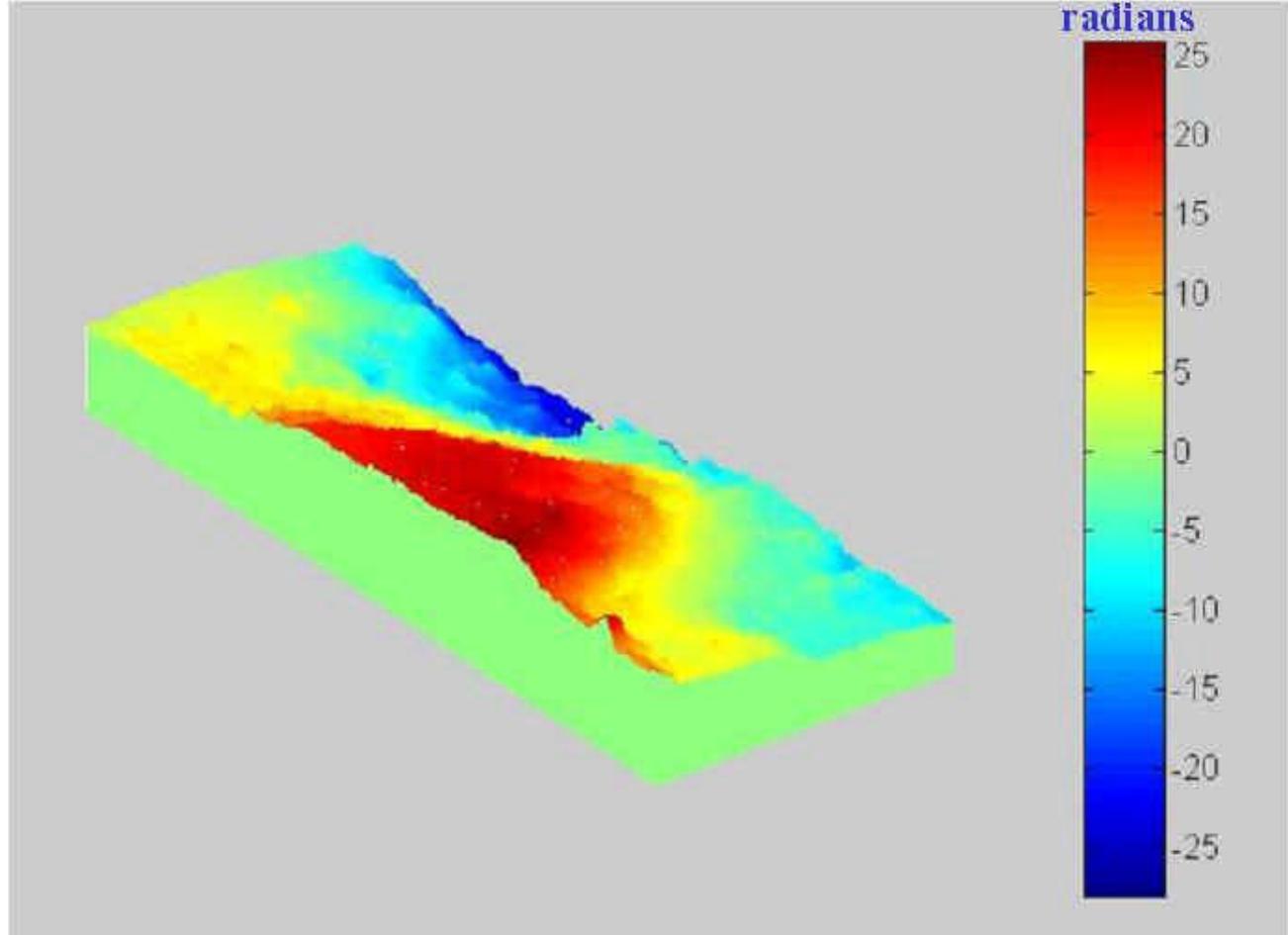


Interferogram with
flat-earth-effect removed

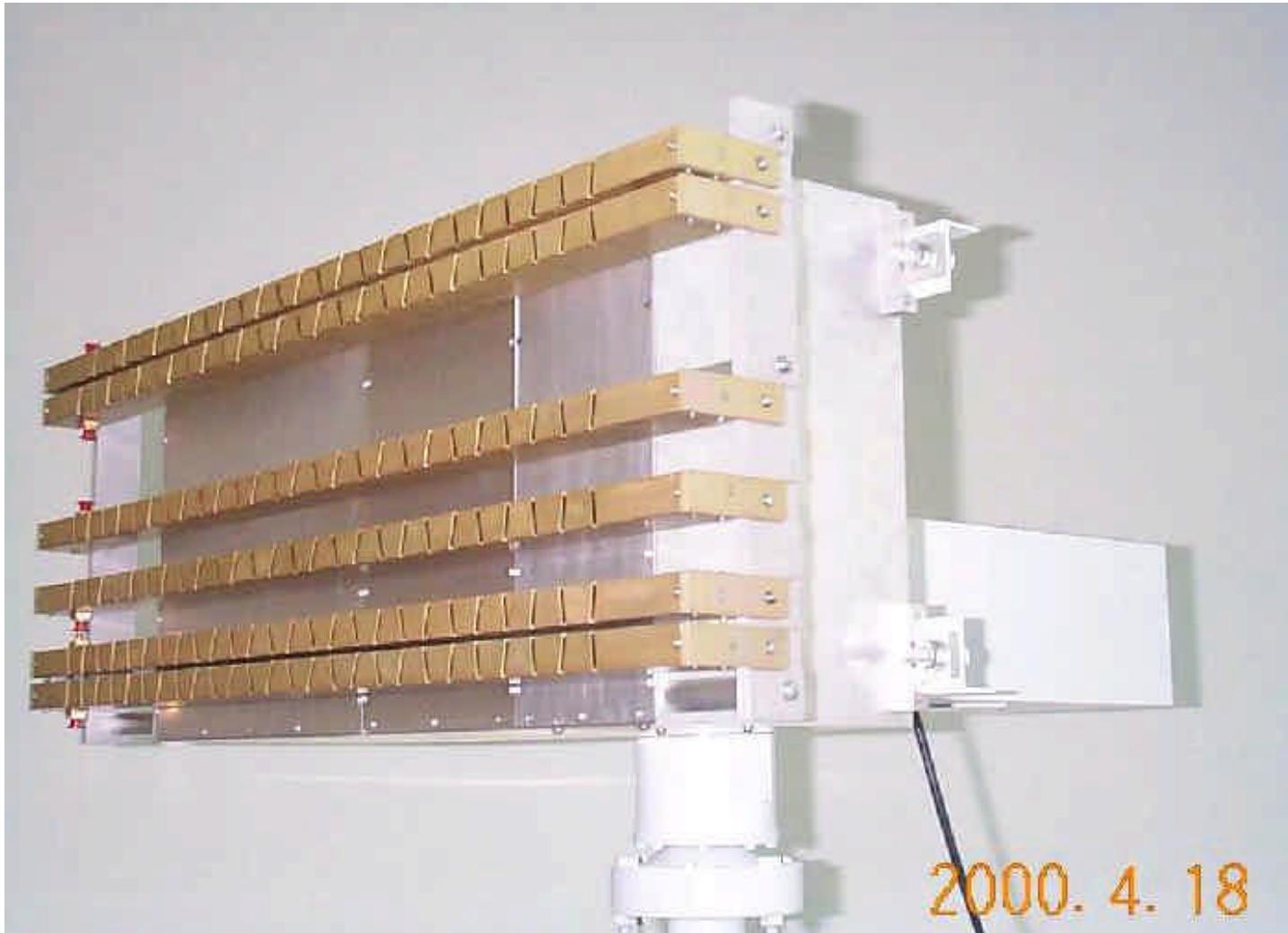


Coherent image





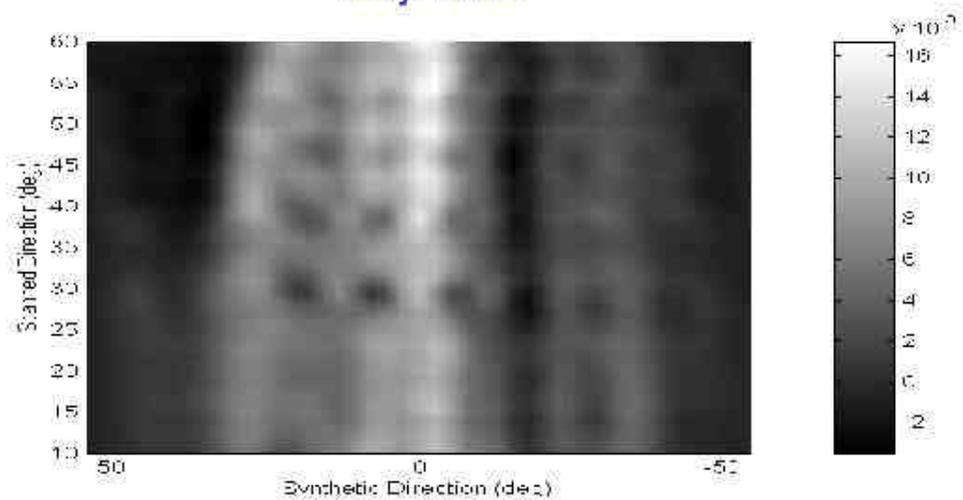
4. (2) C-band Synthetic Aperture Radiometer



Imaging target



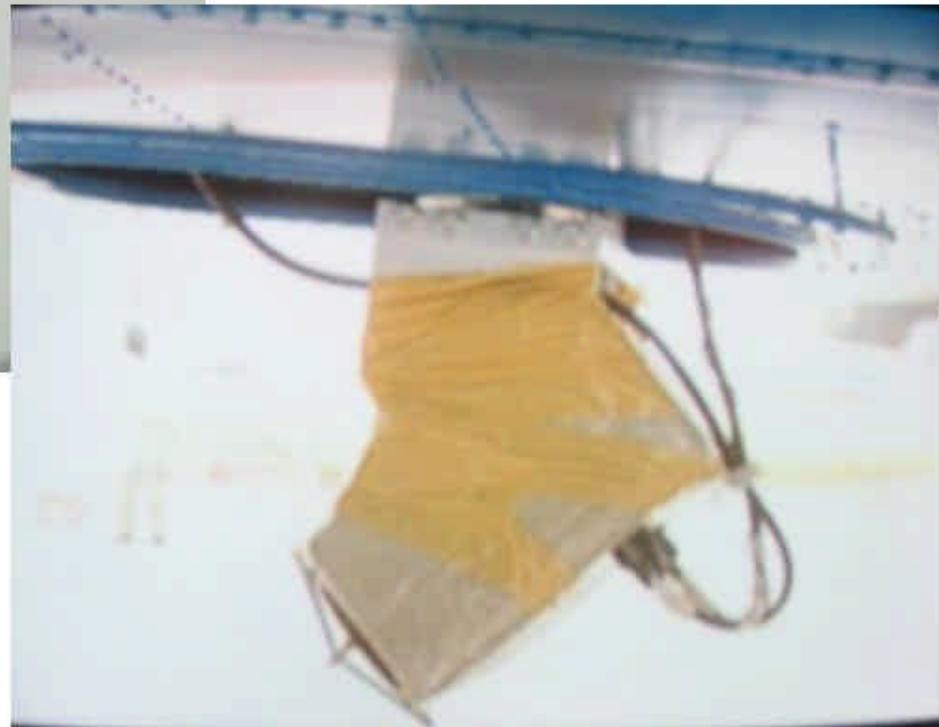
Day time



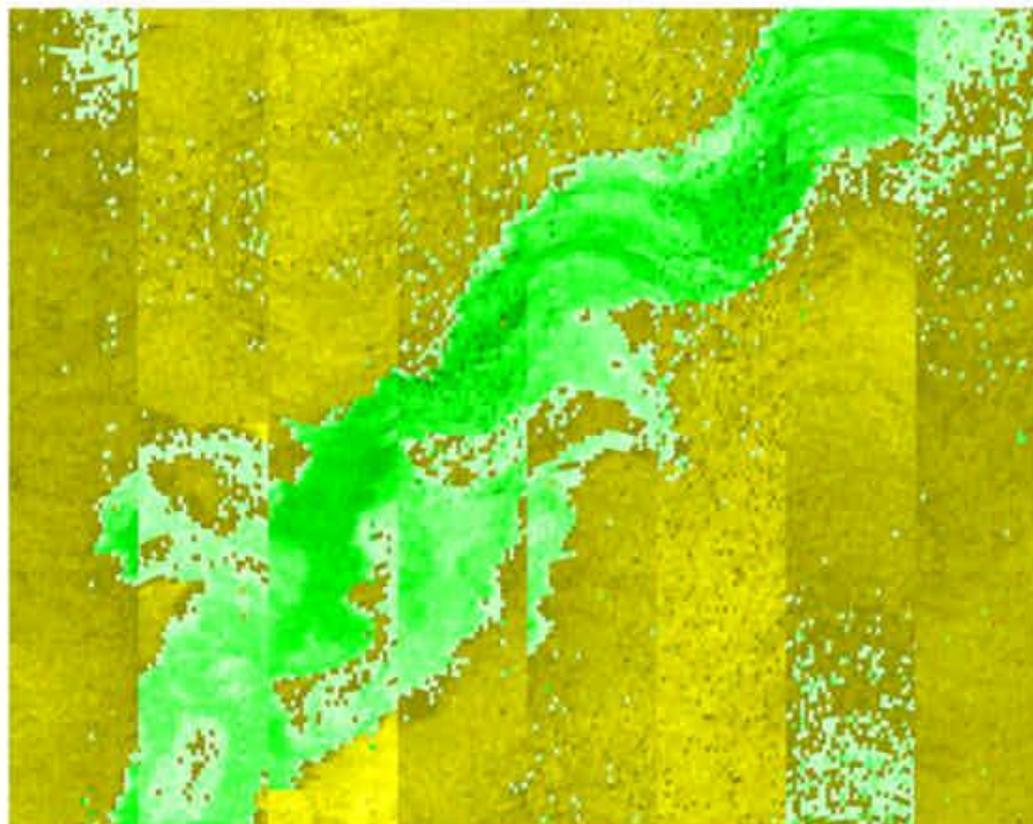
Night time



4. (3) 90GHz Scanning Radiometer



35 20'
110 21'



35 14'
110 21'

35 20'
110 24.5'



35 14'
110 24.5'

黄河(Yellow River)
机载W波段辐射计扫描成像试验
Imaging Experiment of Airborne W-band Microwave Radiometer

2002. 04. 26



Under proposed projects:

- Polarimetric Radiometer
- Polarimetric Scatterometer