Absolute calibration in Brazil

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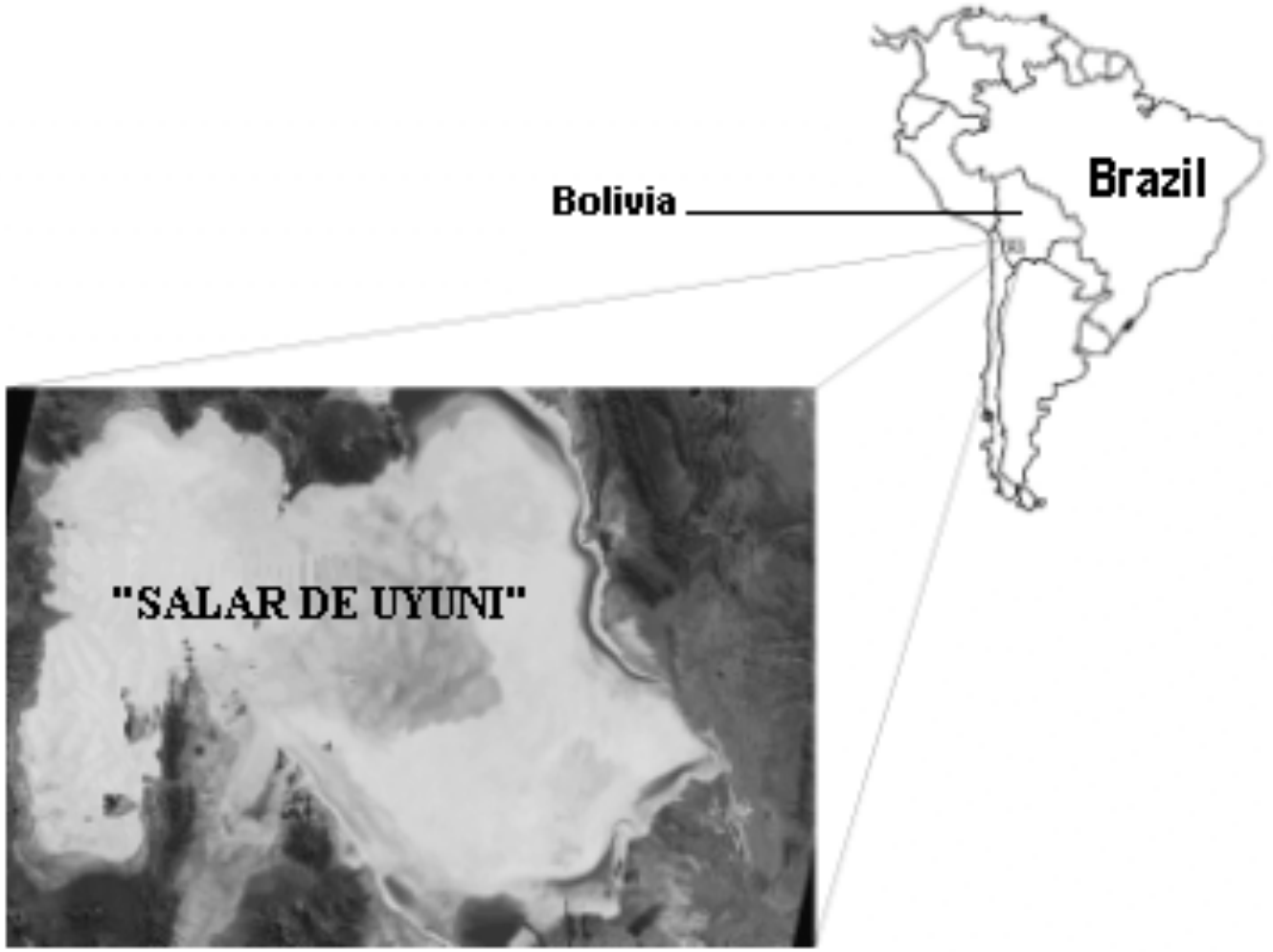
Summary

- Motivation;
- First calibration task;
- CBERS program;
- Calibration in Brazil?
- CBERS sensors absolute calibration;
- Future challenges.

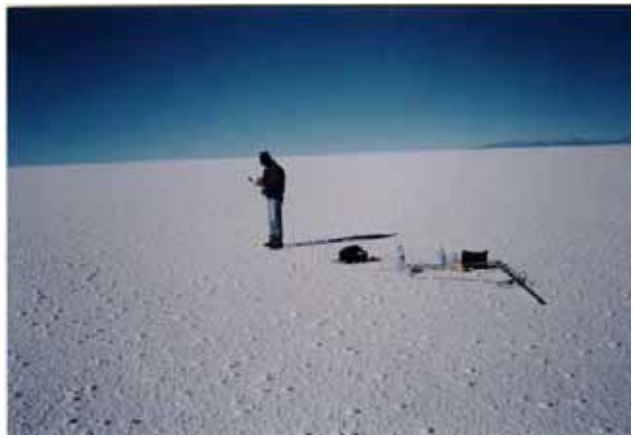
Motivation

- Global changes agendas (CO_2 emission);
- Biophysical parameters estimation (quantitative approaches);
- DN to physical parameters conversion (radiance or reflectance-BRF).

First calibration task



First calibration task



First calibration task

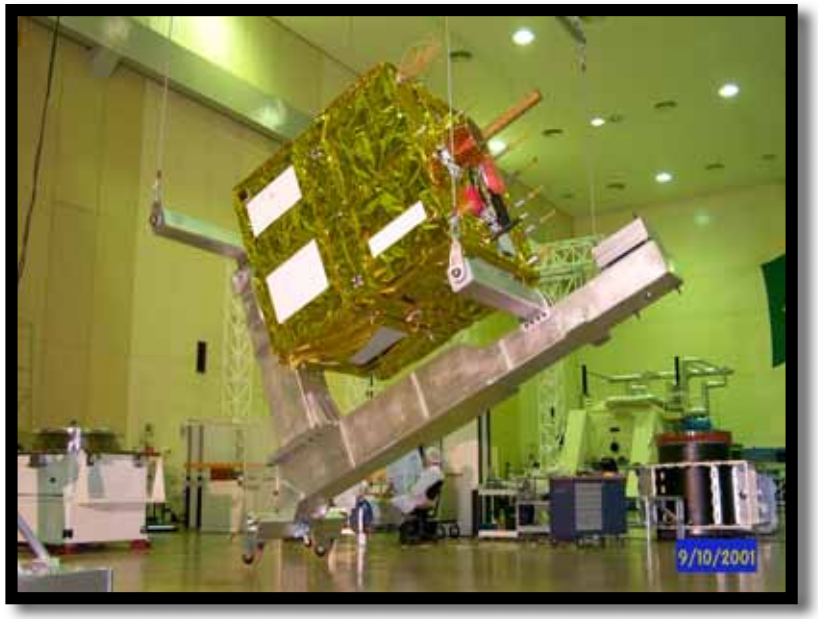
Table 1 – Calibration coefficients determined considering point 1

Geometrical parameters for POINT 1					
Solar zenith angle	56.03 deg.				
Solar azimuth angle	41.63 deg.				
Observation zenith angle	00.00 deg.				
Observation azimuth angle	00.00 deg				
Localization and environment data					
Latitude	-20.21 deg.				
Longitude	-67.47 deg.				
Elevation	3660 m				
Pressure					
Temperature					
Relative humidity					
Atmospheric model identity					
User defined water content	0.190 g/cm2				
User defined ozone content	0.300 cm-atm				
Continental aerosol model (optical depth)	0.171				
Optical condition identity					
User defined optical thickness					
Visibility					
Spectral Landsat5_TM bands	**TM1**	**TM2**	**TM3**	**TM4**	
Spectral condition					
Filter function: wavelength inferior (μm)	0.430	0.500	0.590	0.730	
Filter function: wavelength superior (μm)	0.550	0.650	0.750	0.945	
Surface reflectance	0.749	0.747	0.747	0.746	
Apparent reflectance	0.709	0.667	0.688	0.716	
Apparent radiance	239.840	211.390	183.880	129.590	
Total gaseous transmittance	0.983	0.918	0.942	0.981	
Irradiance at the top of atmosphere (W/m^2)	1902.920	1782.790	1503.850	1017.750	
Direct solar irradiance at ground level (W/m^2)	41.800	54.784	44.417	60.959	
Diffuse atm. irradiance at ground level (W/m^2)	12.175	9.715	5.324	4.174	
Environment irradiance at ground level (W/m^2)	6.411	4.634	2.245	1.453	
Atmospheric radiance at orbital level ($W/m^2.sr$)	1.560	0.931	0.406	0.236	
Background radiance at orbital level ($W/m^2.sr$)	1.808	1.417	0.784	0.621	
Pixel radiance at orbital level ($W/m^2.sr$)	11.262	13.719	10.946	14.824	
Average image digital count	255	147.110	178.00	147.00	
Counts per unit radiance	_	0.696	0.968	1.134	

China-Brazil Earth Resources Satellite Program

- 1988 : agreement between Brazil and China to develop CBERS-1 and CBERS-2;
- 1999: CBERS-1 launching;
- 2002: agreement for CBERS-3 and CBERS-4;
- 2003: CBERS-2 launching;
- 2004: agreement for CBERS-2b;
- 2007: agreement for CBERS-5 and CBERS-6.

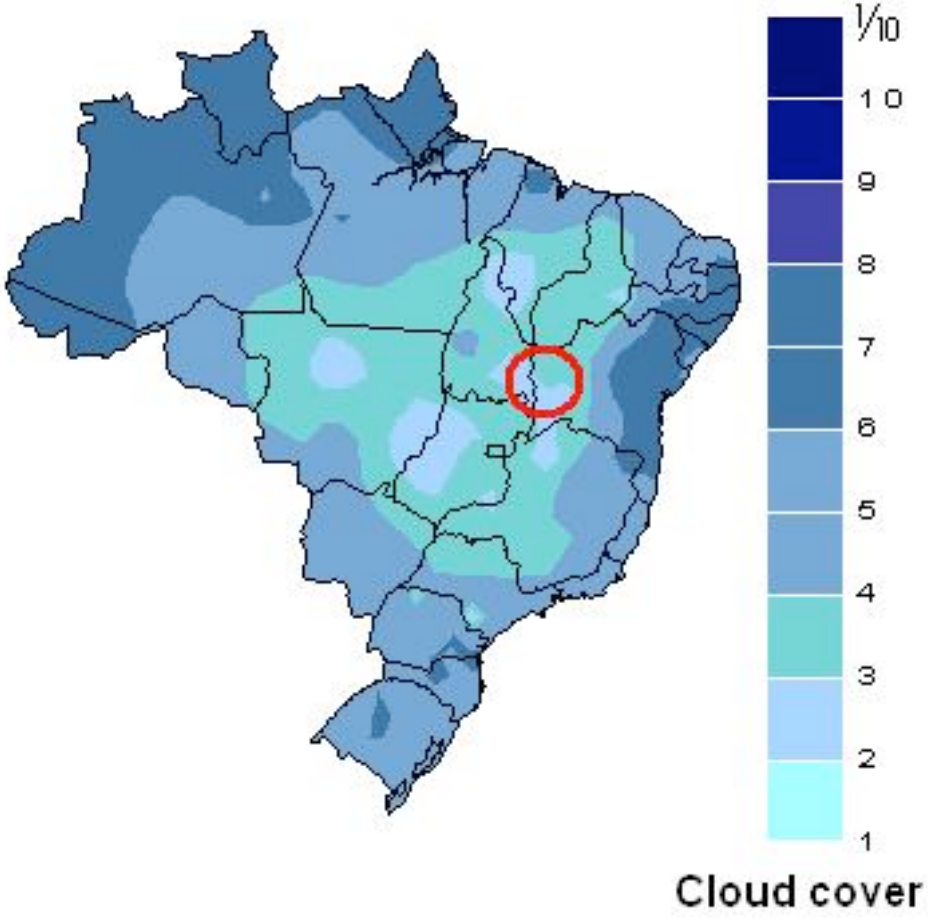
China-Brazil Earth Resources Satellite Program



2000-2002: How to perform a vicarious calibration campaign in Brazil ?

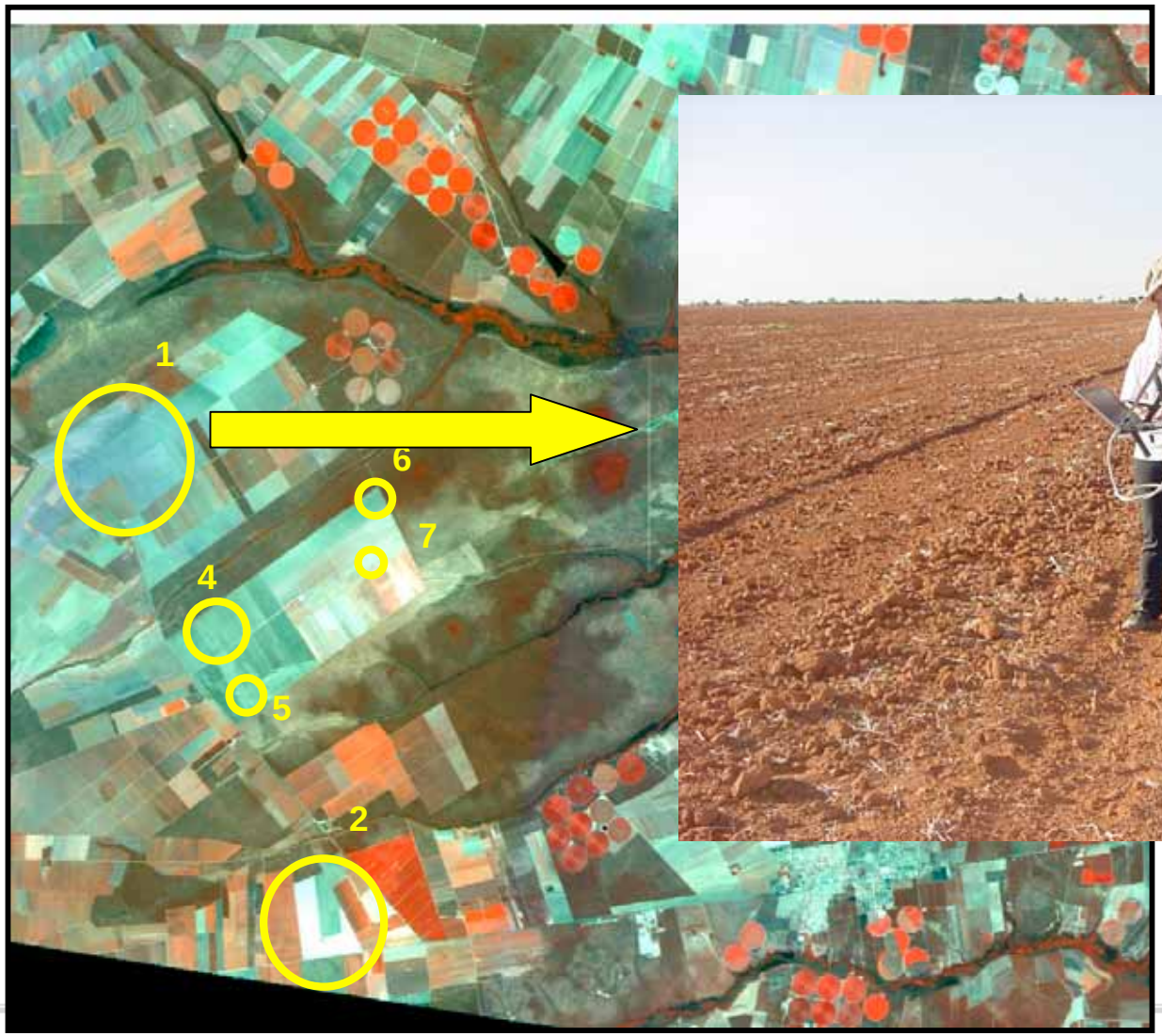
- No enough experience;
- Not easy to go abroad;
- No ideal reference surfaces;
- A “starved” Brazilian remote sensing community.

Choosing a reference surface

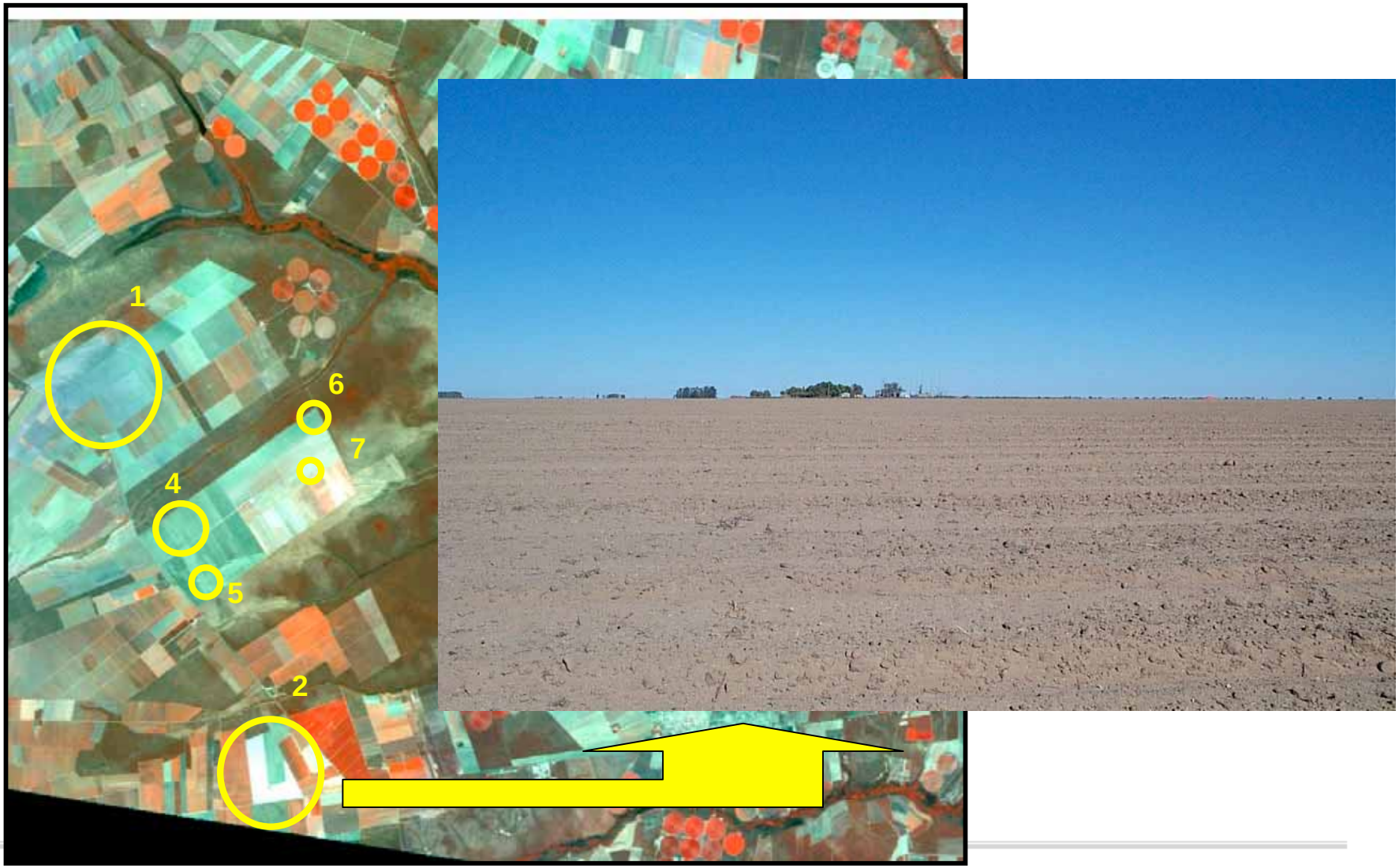


Choosing a reference surface

Performing a calibration campaign



Performing a calibration campaign



Absolute calibration coefficients

Campaign	CCD-1	CCD-2	CCD-3	CCD-4	CCD-pan
Pre-launch	0.980	1.590	1.200	2.290	1.250
August	1.009	1.930	1.154	2.127	1.483

CHINA	*CCD_1*	*CCD_2*	*CCD_3*	*CCD_4*
August 19th	0,9917	1,6761	1,0096	2,0613
August 25th	1,0292	1,7254	1,0356	2,1515

Future challenges

- Atmospheric correction: MODIS x Sunphotometer;
- Validation: there is not a formal and defined strategy;
- Improving the radiometric data collection from the reference surface during the satellite overpass;

Future challenges

- To guarantee periodic and systematic vicarious calibration campaigns;
- Developing a creative and efficient way to properly inform the remote sensing community about the criteria and procedures adopted in the calibration coefficients determination;

Future challenges

- Making easier the updated calibration coefficient access;
- Generating trusted products from the calibration coefficients application (BRF images and/or vegetation indices images);
- Motivating students and other professionals to dedicate efforts in improving calibration in Brazil.