MSS Quality Check

ESRIN – Friday,March, 11, 2011

Agenda

- MSS Mission profile
- Format
- Geolocation
- Radiometric Calibration
- Image Quality

Landsat Series

Satellite	Sensors	Launch date	Decommission	Altitude (km)	Inclination (degrees)	Period (min)	Repeat Cycle (days)	Crossing time (a.m.)
Landsat 1	MSS and RBV	July 23, 1972	January 7, 1978	920	99.20	103.34	18	9:30
Landsat 2	MSS and RBV	January 22, 1975	February 25, 1982	920	99.20	103.34	18	9:30
Landsat 3	MSS and RBV	March 5, 1978	March 31, 1983	920	99.20	103.34	18	9:30
Landsat 4	MSS and TM	July 16, 1982	June 30, 2001	705	98.20	98.20	16	09:45
Landsat 5	MSS and TM	March 1, 1984	Operational	705	98.20	98.20	16	09:45
Landsat 6	ETM	October 5, 1993	Did not achieve orbit					
Landsat 7	ETM+	April 15, 1999	Operational	705	98.20	98.20	16	10:00
EO-1 ALI	ALI	November 21, 2000	Operational	705	98.20	98.20	16	10:01

Format

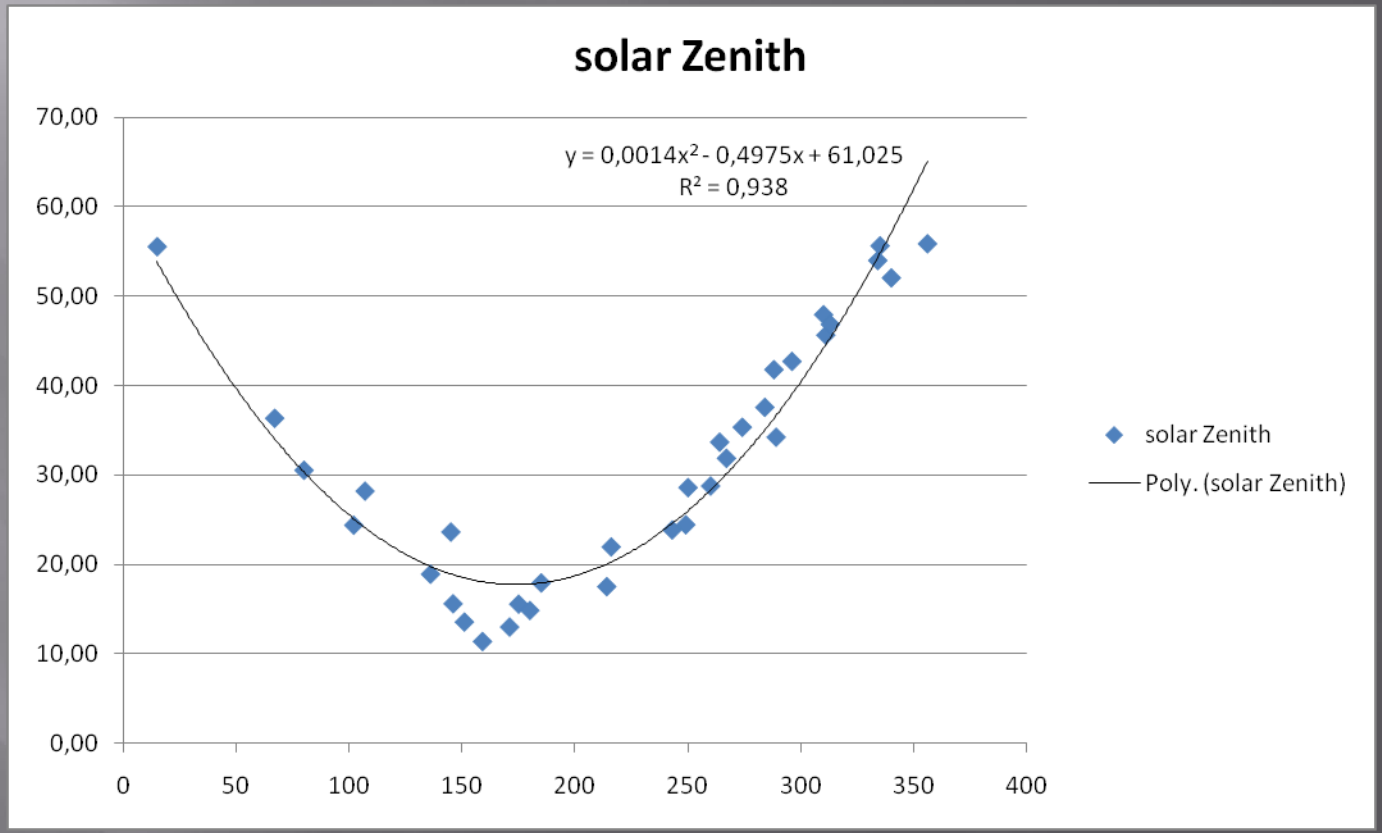
- CEOS, “SSC MSS CEOS Data Format Specifications”
- FAST 1G Path / Map,
- GEOTiff Format, 1G Path / Map

- Poor Metadata Content,
- No GCP point, no model,
- No rescaling coefficient, radiometric calibration not applied.

Radiometric Calibration, spectral info

MSS sensors (Qcalmin=0 and Qcalmax=127)							
Band	Spectral range (µm)	Center wavelength (µm)	LMIN W/(m2 sr	LMAX W/(m2 sr µm)	Grescale (W/m2 sr µm)/DN	Brescale W/(m2 sr µm)	ESUN W/(m2 µm)
L1 MSS (NLAPS)							
1	0.499-0.597	0.548	0	248	1.952760	0	1823
2	0.603-0.701	0.652	0	200	1.574800	0	1559
3	0.694-0.800	0.747	0	176	1.385830	0	1276
4	0.810-0.989	0.900	0	153	1.204720	0	880.1
L2 MSS (NLAPS)							
1	0.497-0.598	0.548	8	263	2.007870	8	1829
2	0.607-0.710	0.659	6	176	1.338580 6	6	1539
3	0.697-0.802	0.750	6	152	1.149610 6	6	1268
4	0.807-0.990	0.899	3.66667	130.333	0.997373	3.66667	886.6
L3 MSS (NLAPS)							
1	0.497-0.593	0.545	4	259	2.007870	4	1839
2	0.606-0.705	0.656	3	179	1.385830	3	1555
2	0.693-0.793	0.743	3	149	1.149610	3	1291
4	0.812-0.979	0.896	1	128	1.000000	1	887.9
L4 MSS (NLAPS)							
1	1 0.495-0.605	0.550	4	238	1.842520	4	1827
2	2 0.603-0.696	0.650	4	164	1.259840	4	1569
2	3 0.701-0.813	0.757	5	142	1.078740	5	1260
4	4 0.808-1.023	0.916	4	116	0.881890	4	866.4
L5 MSS (NLAPS)							
1	1 0.497-0.607	0.552	3	268	2.086610	3	1824
2	2 0.603-0.697	0.650	3	179	1.385830	3	1570
2	3 0.704-0.814	0.759	5	148	1.125980	5	1249
4	4 0.809-1.036	0.923	3	123	0.944882	3	853.4

Radiometric Calibration

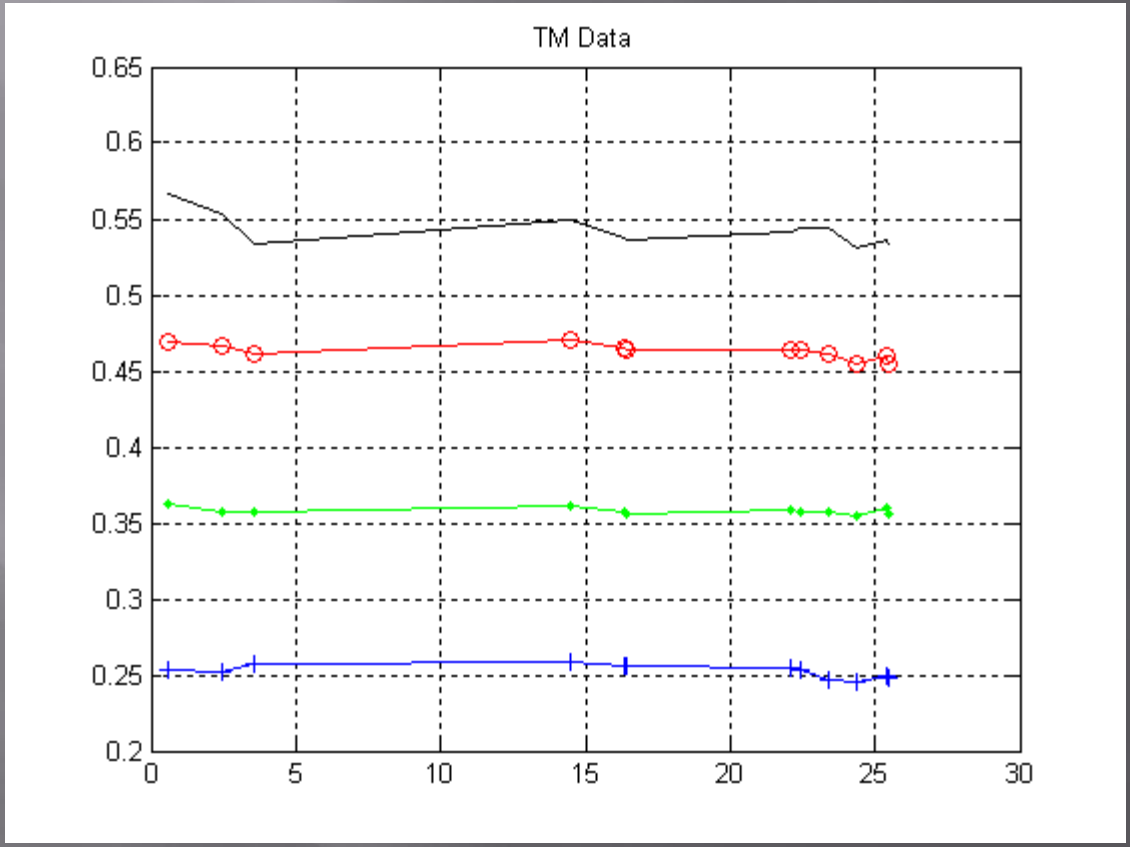


Radiometric Calibration

- ESUN
- Rescaling Gain
- ACS Method,
  - equalization on RAW DNs
  - PL calibration discussed in the TPM PL ATBD document but not implemented.

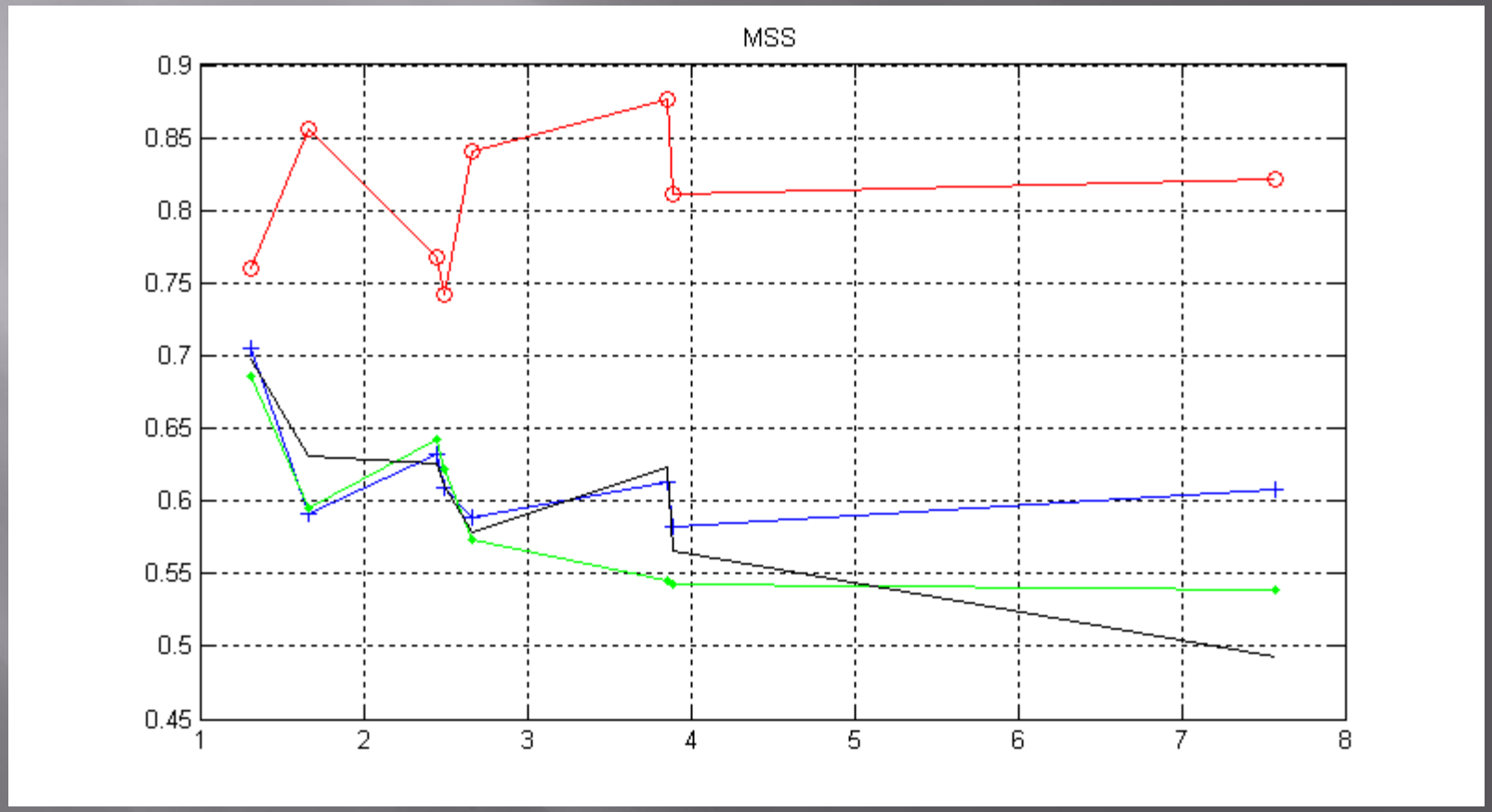
Radiometric Calibration

- Stability and comparison with TM



Radiometric Calibration

- Stability and comparison with TM



Radiometric Calibration

- Statistics, radiometric calibration stability over stable and homogeneous site, Libya.

TM	bd1	bd2	bd3	bd4
Mean	0.2528	0.35793	0.46278	0.54211
Std	0.0043779	0.0023053	0.0050982	0.010091

MSS	bd1	bd2	bd3	bd4
Mean	0.61607	0.59305	0.80944	0.60323
Std	0.039296	0.053507	0.04868	0.059568

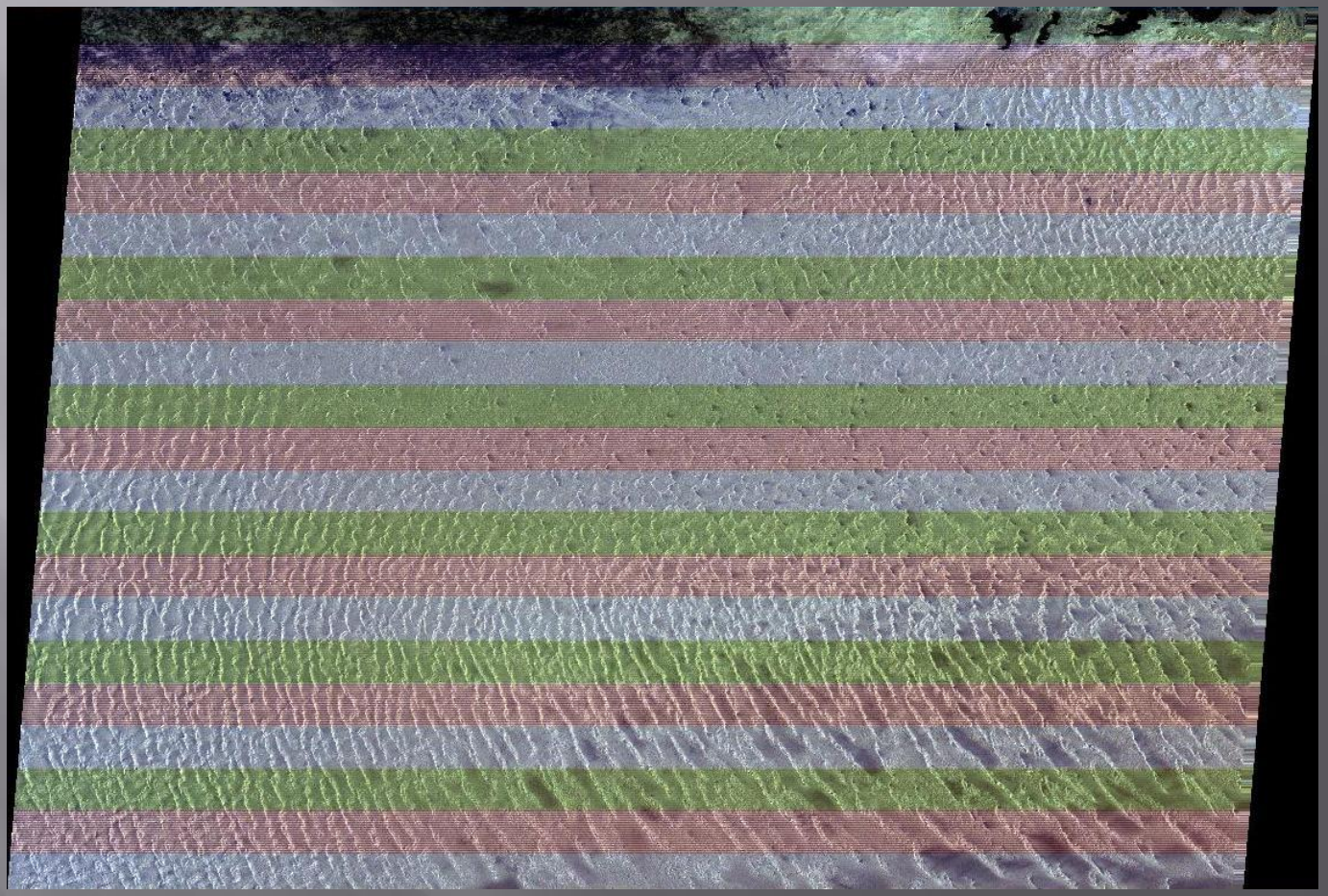
Radiometric Calibration

- Matchup TM / MSS, 125 AOIs ?

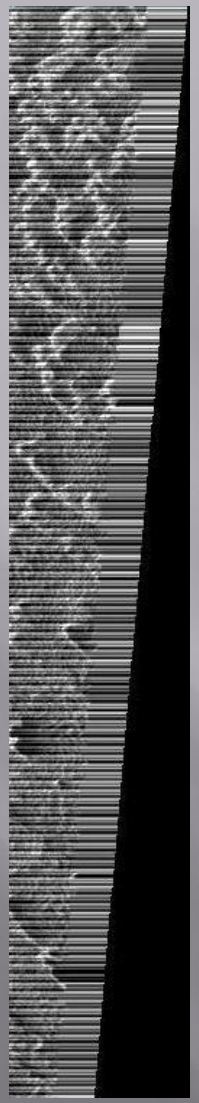
Radiometric Calibration

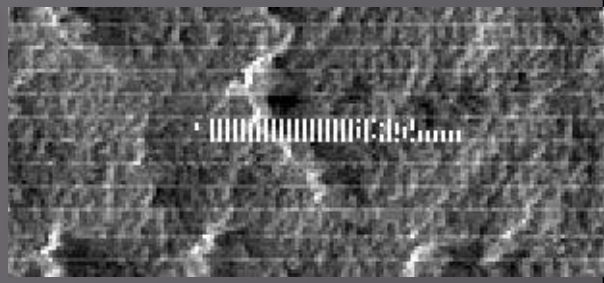
- MSS is not stable, the method used to derive TOA reflectance used coefficients USGS proposed; with hypothesis of NLAPS like processing.
- First problem to resolve, the quantification, the QRAW is not between 0 and 127 as nominaly defined since the data quantification is 7 bits.

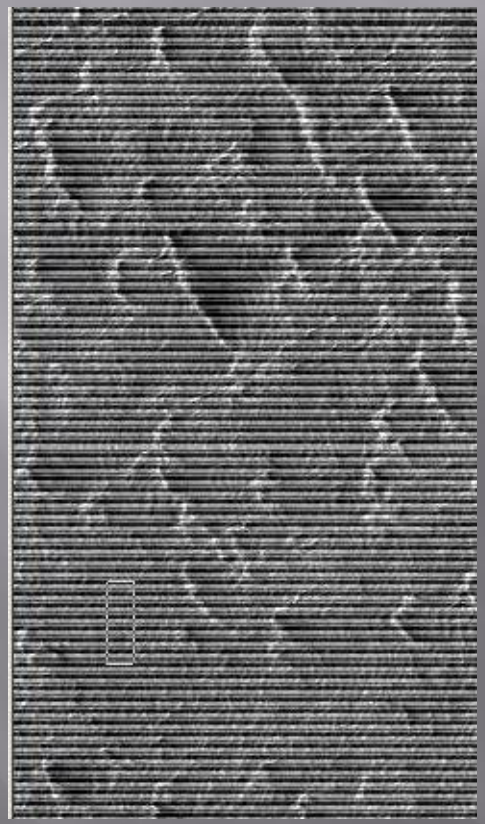
Equalization

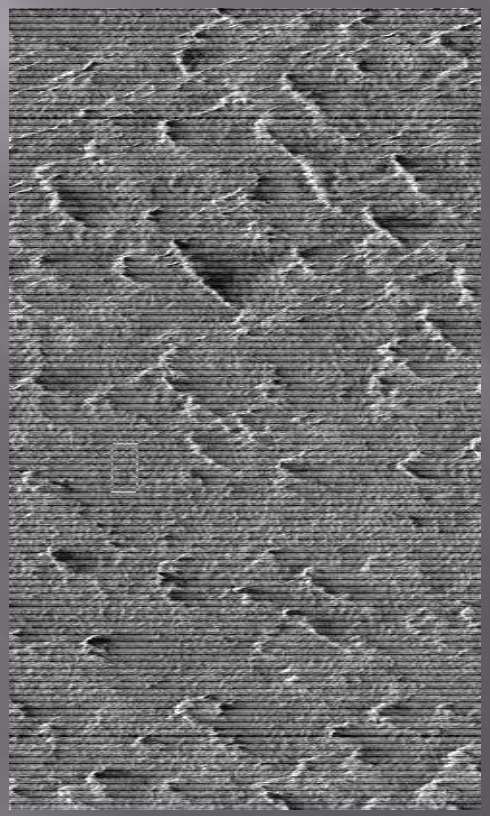


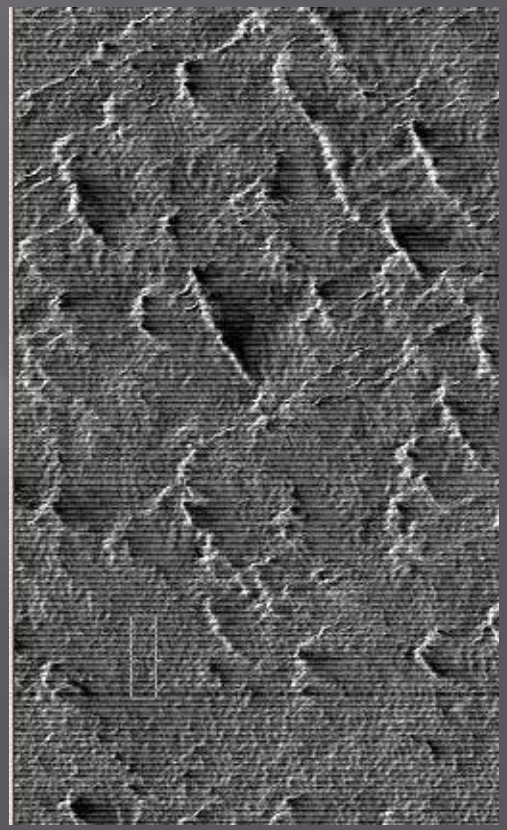
Equalization









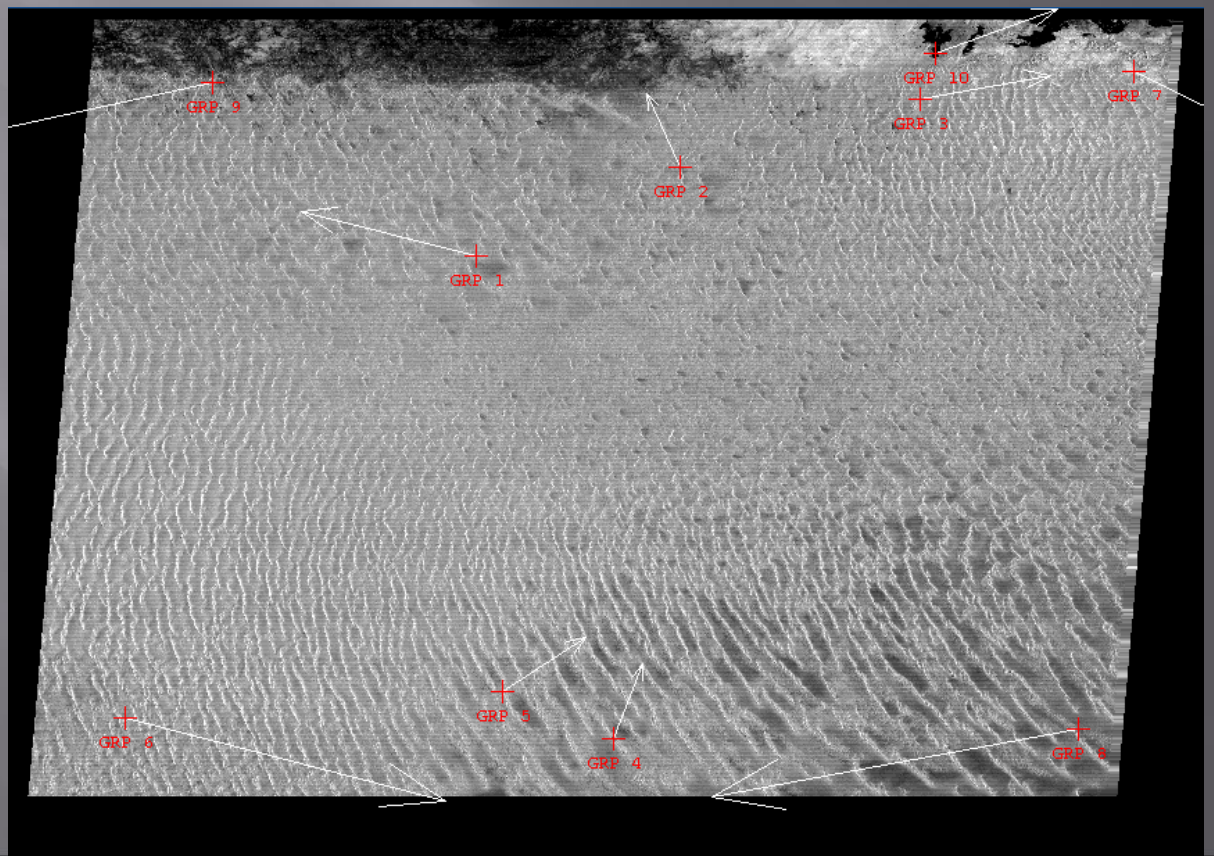


Geolocation

- One GCP is provided with the product, it is still interesting to know the accuracy of these measurement,
- It is also interesting to analyse residual errors when a polynomial model is applied.

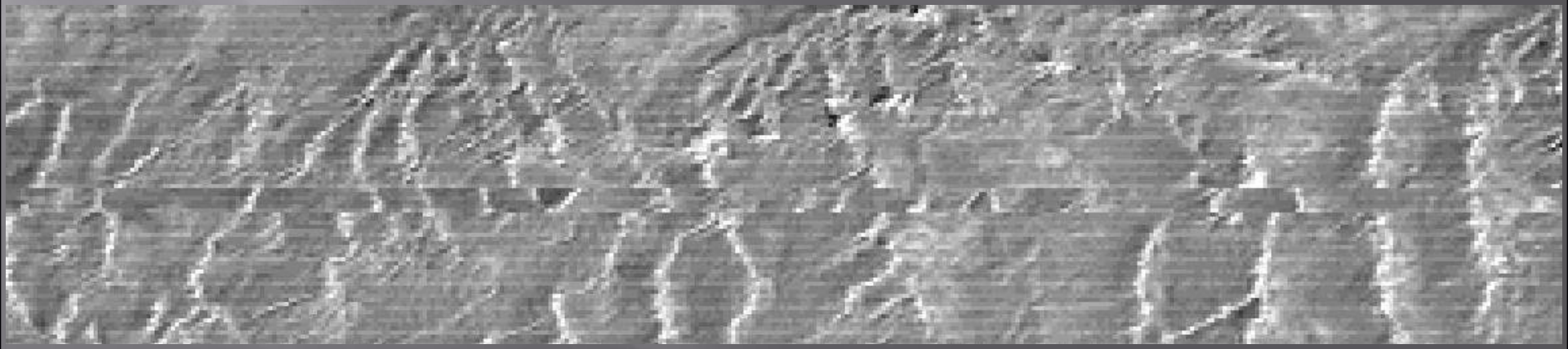
Geolocation

- Accuracy of the polynomial model, 300/400 m. The testfield is not a super site !!!.

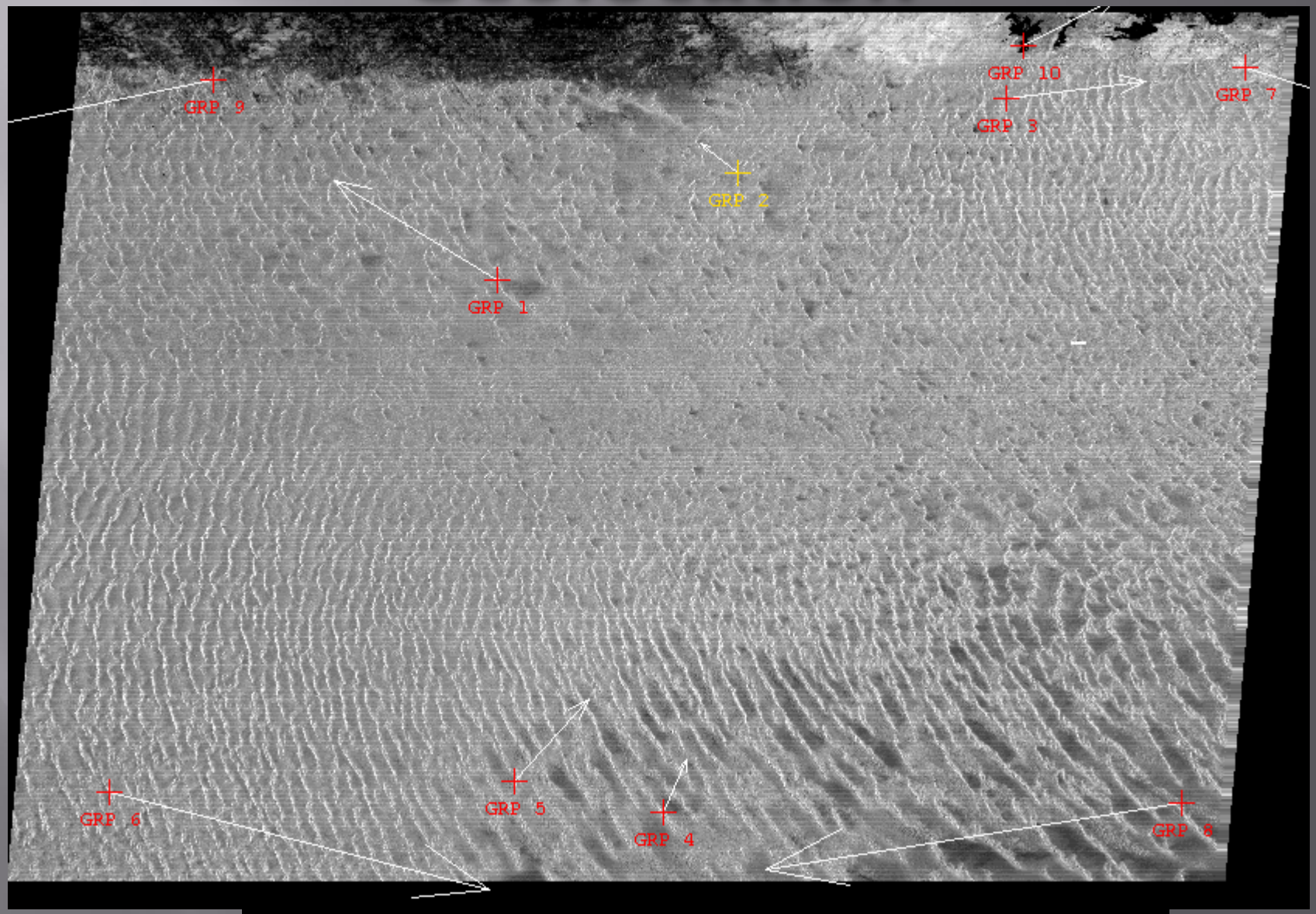


Geolocation

- Accuracy of the polynomial model, 300/400 m. The testfield is not a super site !!!.
- Five dataset and always the same errors, ‘panoramic effect’.
- Some swaths are shifted.

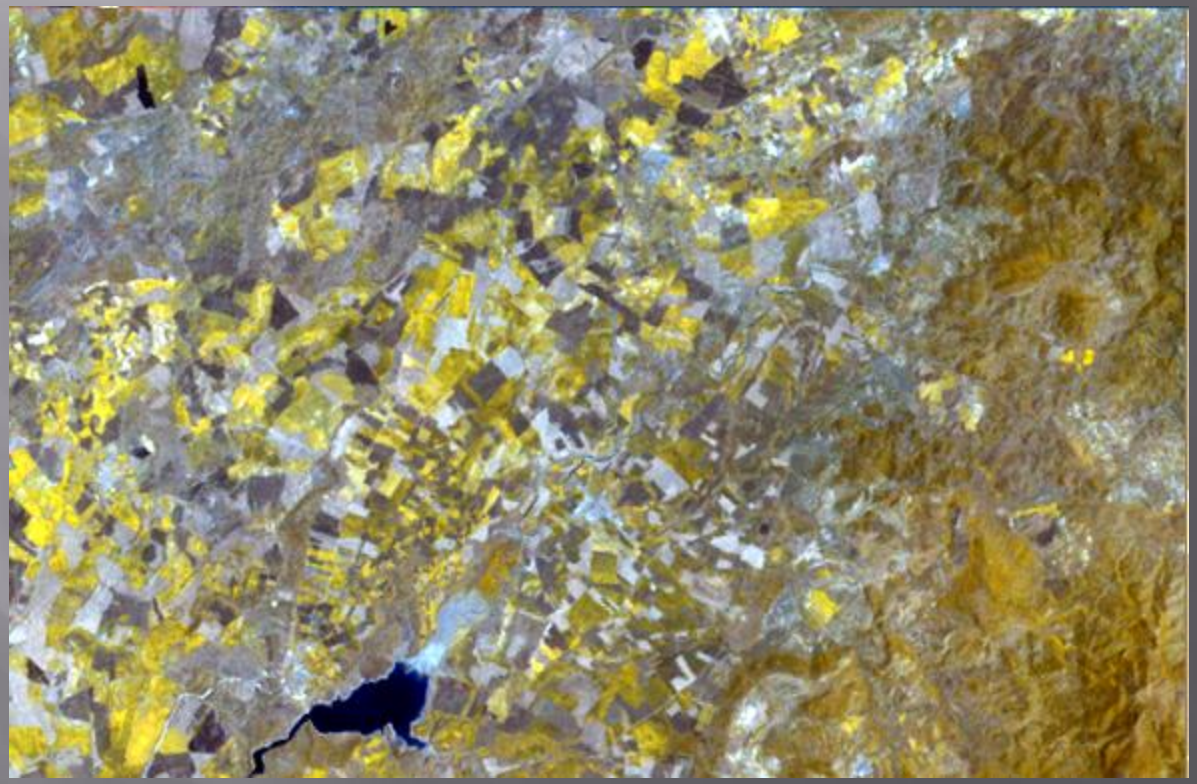


Geolocation



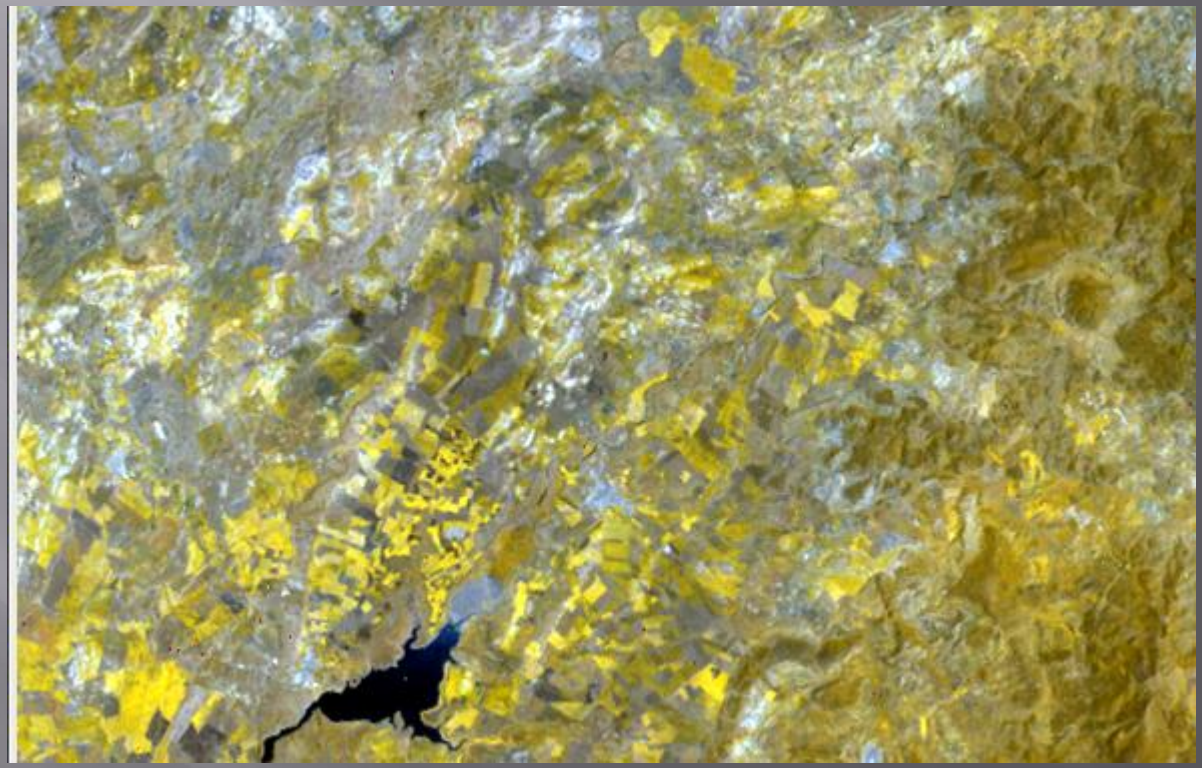
Landsat 1, 1 2 3

Landsat 1, 2 3 4



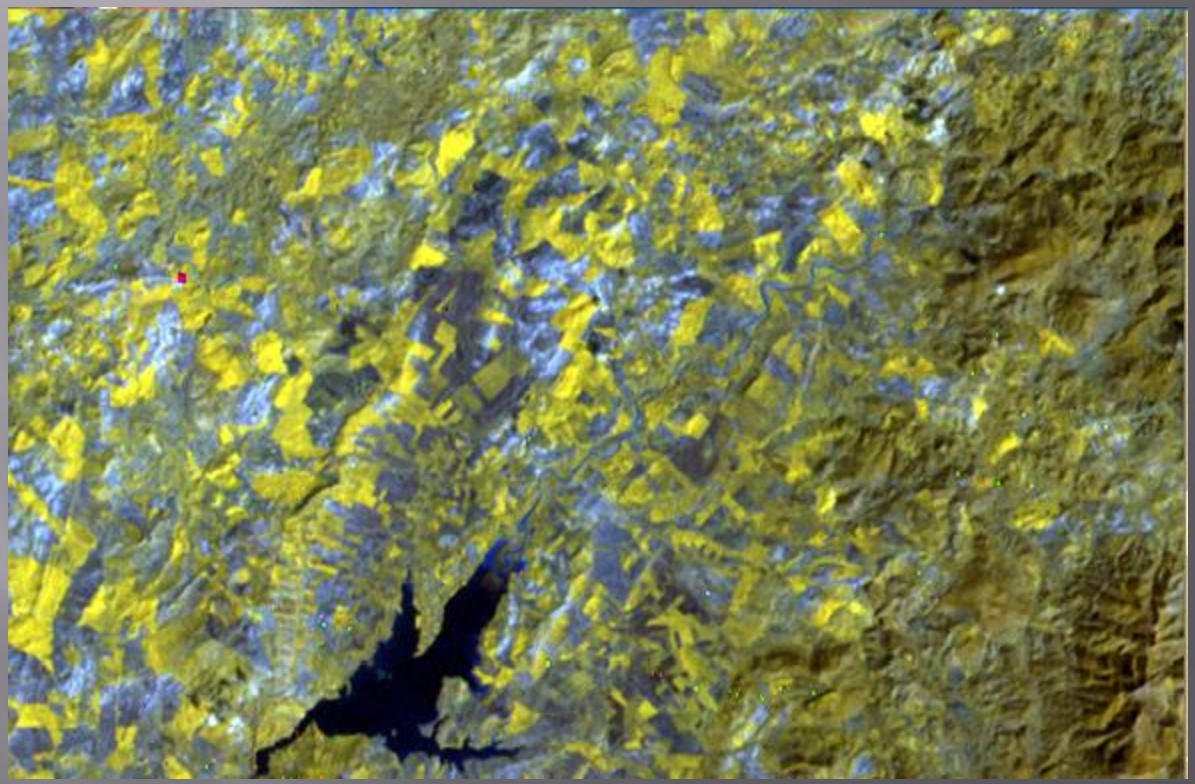
Landsat 2, 1 2 3

Landsat 2, 2 3 4



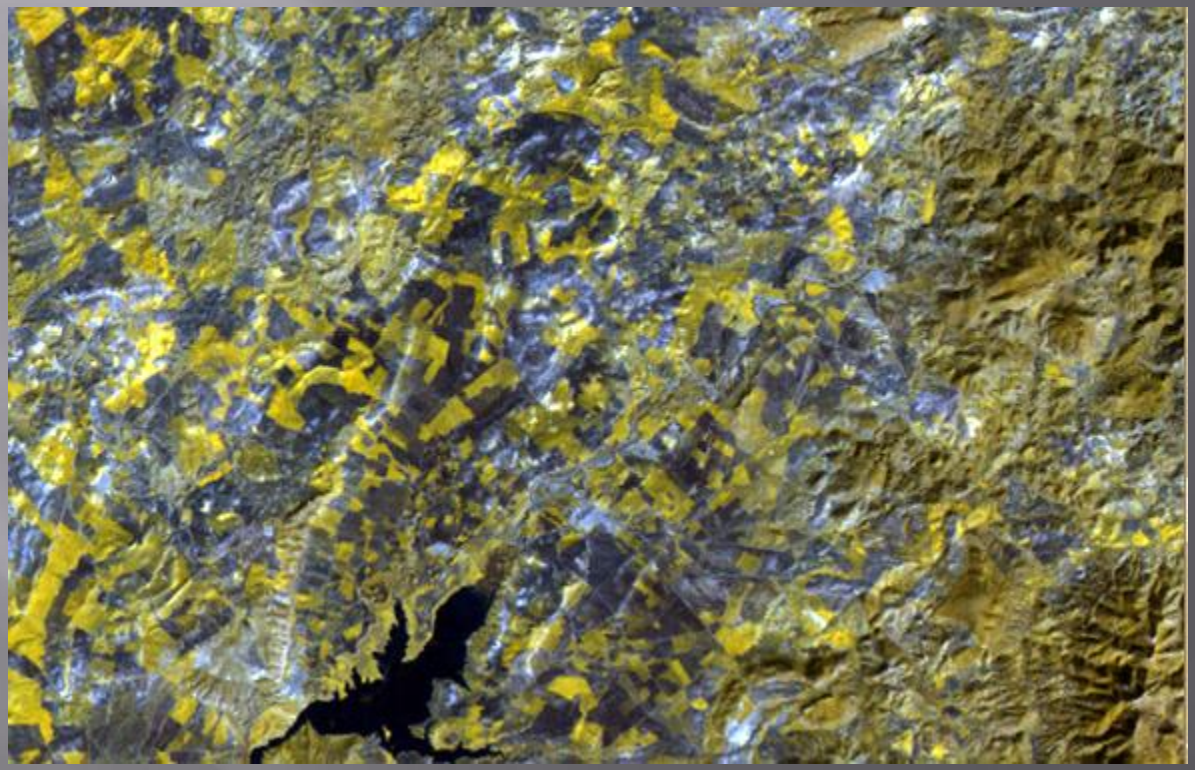
Landsat 3, 1 2 3

Landsat 3, 2 3 4



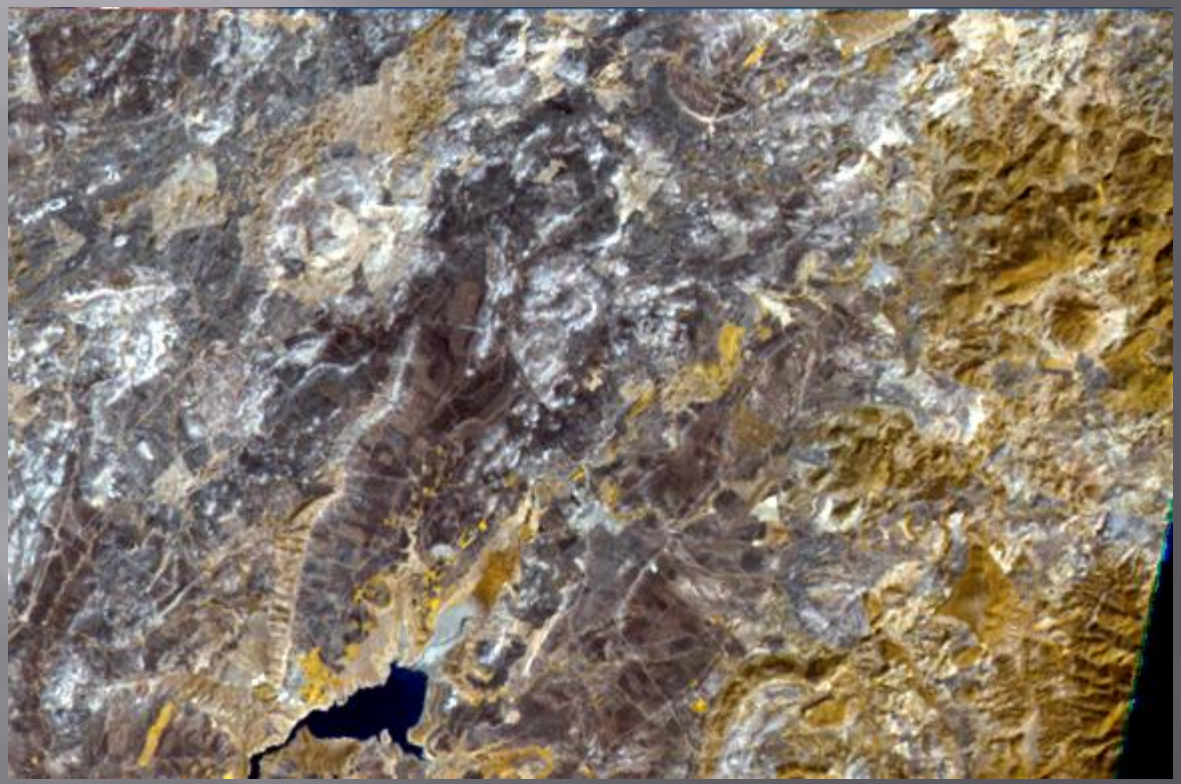
Landsat 4, 1 2 3

Landsat 4, 2 3 4



Landsat 4, 1 2 3

Landsat 4, 2 3 4



Summary 1/2

- Historical data and crucial to put a long term effort on it,
- Nice to see the problem to order data resolved (More than One month),
- A time series of Eight products observed over Libya has been investigated,
- A support in the frame of GW requirement has been performed as well,

Summary 2/2

- The ESA policy toward MSS is « to be defined », a product disposition such 'use as is' could be proposed.
- It will be difficult to fullfil the GW requirements,
- A clear report on the data quality should be dessimated.
- The radiometric calibration issues as to be investigated, the esa MSS products can be anchored to the usgs ones.
- The processing stages should be better detailed and share with the community
- ….