



CEOS/WGCV/IVOS March 2019
GEO SPATIAL QUALITY ACTIVITY

INTRODUCTION

F. Viallefont-Robinet (ONERA)



[retour sur innovation](#)

CONTEXT

- The geo spatial activity was set up in 2011.
- It started with presentations entitled
 - Definition and importance of geo-spatial quality
 - Overview of in-flight MTF measurement methods and corresponding basic theory
- The IVOS was seen as a good place to help the small community working in the geo spatial quality field to
 - meet
 - exchange
 - share their experience
 - establish recommendations to ensure good geo spatial quality.

CONTEXT

- In the 2012-2014 period, letters were sent to collect information about targets, methods and expectations.
- In 2015, a geo spatial quality workshop was organized.
 - It was an opportunity to have a large set of presentations about MTF assessment from various entities and various sensors
 - A roadmap was discussed



RECALL OF THE FRAMEWORK

- The main points of the road map were:
 - **Complete the catalog of sites suitable for MTF measurement**
 - **Share data**
 - **With this shared data, compare MTF measurements**

RECALL OF THE FRAMEWORK

- D. Helder led the field methods survey: answers to letters about targets and methods were used to complete a catalog of targets suited for MTF measurement.

Field Methods Survey



Test sites catalog



https://calval.cr.usgs.gov/apps/test_sites_catalog

TEST SITES CATALOG JACIE

Remote Sensing Technologies

Test Sites Catalog

IN AN ERA WHEN THE NUMBER OF EARTH-OBSERVING SATELLITES IS RAPIDLY GROWING AND MEASUREMENTS FROM THESE SENSORS ARE USED TO ANSWER INCREASINGLY URGENT GLOBAL ISSUES, IT IS IMPERATIVE THAT SCIENTISTS AND DECISION MAKERS RELY ON THE ACCURACY OF EARTH-OBSERVING DATA PRODUCTS. THE CHARACTERIZATION AND CALIBRATION OF THESE SENSORS ARE VITAL TO ACHIEVE AN INTEGRATED GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS (GEOSS) FOR COORDINATED AND SUSTAINED OBSERVATIONS OF EARTH. THE U.S. GEOLOGICAL SURVEY (USGS), AS A SUPPORTING MEMBER OF THE COMMITTEE ON EARTH OBSERVATION SATELLITES (CEOS) AND GEOSS, WORKED WITH PARTNERS AROUND THE WORLD TO ESTABLISH AN ONLINE CATALOG OF PRIME CANDIDATE WORLDWIDE TEST SITES (POSTER) FOR THE POST LAUNCH CHARACTERIZATION AND CALIBRATION OF SPACE-BASED OPTICAL IMAGING SENSORS. THE ONLINE CATALOG PROVIDES EASY PUBLIC WEB-SITE ACCESS TO THIS VITAL INFORMATION FOR THE GLOBAL COMMUNITY. THROUGH GREATER ACCESS TO AND UNDERSTANDING OF THESE VITAL TEST SITES AND THEIR USE, THE VALIDITY AND UTILITY OF INFORMATION GAINED FROM EARTH REMOTE SENSING WILL CONTINUE TO IMPROVE. CONTACT INFORMATION: GREGORY L. STENSAAS stensaas@usgs.gov OR JON CHRISTOPHERSON jonchris@contractor.usgs.gov

Radiometric Sites
- Choose -

Geometric Sites
- Choose -

Spatial Sites
- Choose -

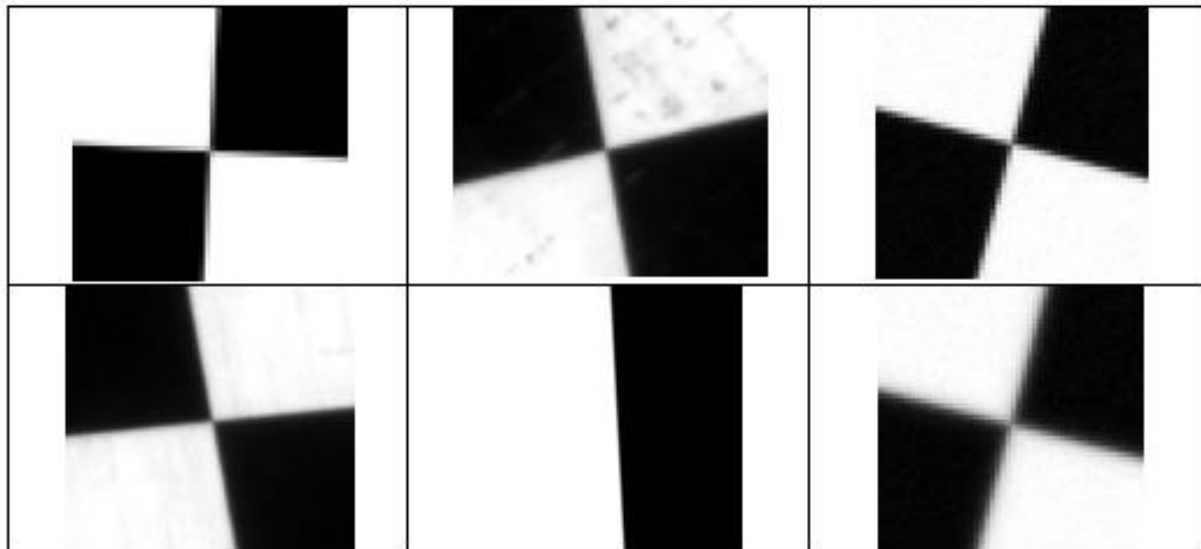
RECALL OF THE FRAMEWORK

- In 2015, a team was created to work on the MTF measurement methods beginning with the edge method. Three participants provided edge images.

Shared data for MTF measurement



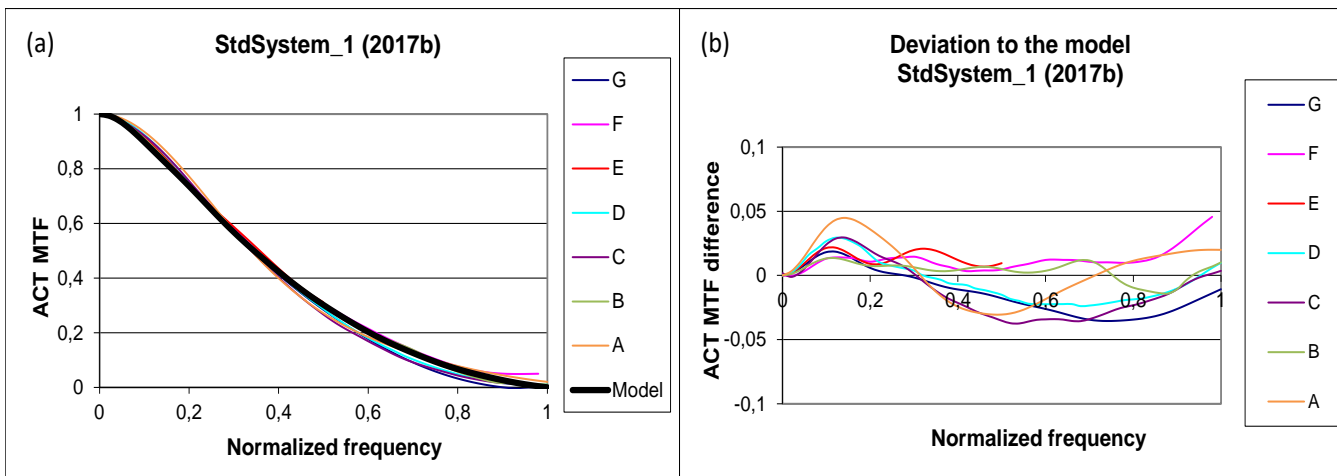
Initiate reference dataset



RECALL OF THE FRAMEWORK

- From 2016 to 2017, processing of the reference edge images and MTF comparisons
- 2018: paper writing and reference dataset preparation

MTF measurement comparison \longrightarrow Reference dataset preparation



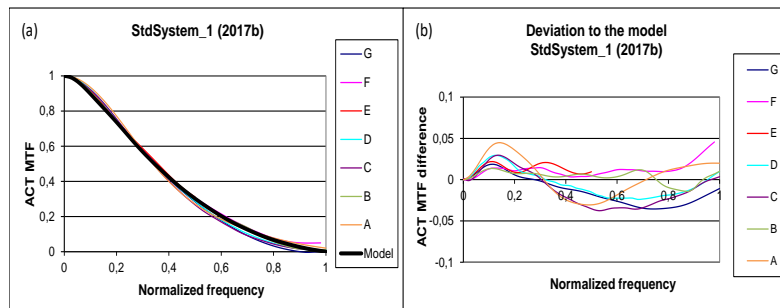
NEW RESULTS

- 2018: paper published and reference dataset created

MTF measurement comparison



paper published



Comparison of MTF measurements using the edge method: towards a reference dataset

FRANÇOISE VIALLEFONT-ROBINET, DENNIS HELDER, RENAUD FRAISSE, AMY NEWBURY, FRANS VAN DEN BERGH, DONGHAN LEE, and SÉBASTIEN SAUNIER

Optics Express Vol 26, Issue 26, 33625-33648, 2018

<https://doi.org/10.1364/OE.26.033625>

NEW RESULTS

- 2018: paper published and reference dataset created

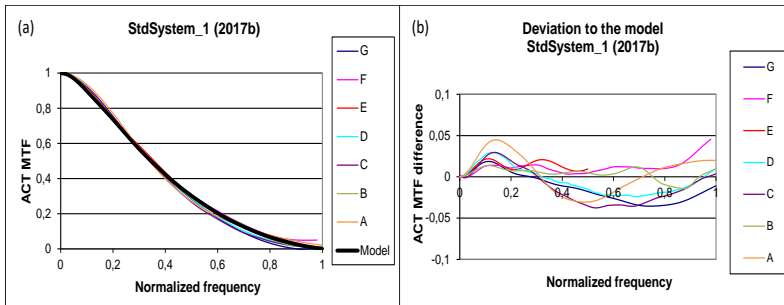
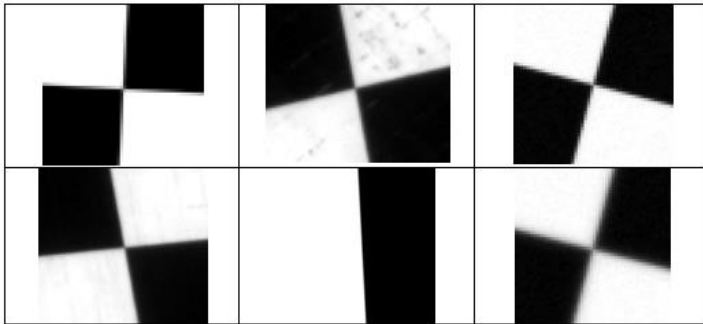
MTF measurement comparison

+

Shared data for MTF measurement



Reference dataset



MONDAY AFTERNOON MAJOR ACTIVITIES

- Regular activity:
 - New or updated presentations about geo spatial quality
 - Review of actions
- Discussion:
 - Catalog status
 - MTF assessment with lunar images and relationship with GSICS MTF group
 - Roadmap

AGENDA

16:00	MTF workshop	
16:00	Introduction	Françoise Viallefont-Robinet (ONERA)
16:15	Analysis on Refinement of On-orbit MTF Measurement using Edge Target (Updated from JACIE)	DaeSoon Park, DongHan Lee (KARI)
16:30	A Study on SNR Measurement Using Side-Slither Image Data of KOMPSAT-3A (Updated from JACIE)	DongHan Lee, YouKyung Seo (KARI)
16:45	Review of actions and discussion: catalog, GSICS MTF group, roadmap (including NIIRS)	Françoise Viallefont-Robinet (ONERA)
18:00	Meeting close	

ACTIONS FROM LAST MEETING(s)

1. Create first Geospatial Reference Data Set, **status: done**
2. Forward information to IVOS Chair (**done**) for transmittal to WGCV, **status: in progress**
3. Write Journal Paper on MTF estimation methods, **status: done**
4. Finalize Comprehensive Test Site Catalog
 - a) Add KARI site in Mongolia, **status: to do**
 - b) Add Australia line target used by Digital Globe, **status: to do**
 - c) Forward to IVOS Chair for transmittal to WGCV, **status: to do**
 - d) Migration of the catalog to the CalVal portal, **status: to do**

MEETING RESULTS

- Catalog status
 - Transfer Dennis Helder's actions (4. a, b, c d) and new ones to Françoise Viallefont-Robinet and Cody Anderson
 - Add/update information for existing sites
 - First **action** for Françoise: Refine the list of actions and propose their dispatching between Cody and Françoise

MEETING RESULTS

- Recall about relationship with GSICS MTF group working on MTF assessment with lunar images
 - MTF report presentation from last IVOS plenary session sent to Dr Wu, Dr Yu and Dr Shao from NOAA in april 2018
 - Dr Wu's answer few days later: proposal to send a GOES image to work with and then compare IVOS group results with the ones from GSICS
 - Internal discussion on the IVOS side: no answer to GSICS up to now

MEETING RESULT

- Relationship with GSICS MTF group working on MTF assessment with lunar images
 - ❖ **Discussion result:**
 - Try with the GOES image from GSICS MTF group and the MODIS image that X. Xiong proposed to share
 - Suggest to GSICS group to measure MTF with at least one image from the reference dataset
 - Propose to GSICS MTF group to present its activity at next IVOS meeting
 - **Action** for Françoise: email to Dr Wu

MEETING RESULTS

- Roadmap discussion
 - Other metrics:
 - ❖ Topic chosen last meeting
 - ❖ RER, FWHM, ER slope, Edge overshoot, ...
and think about their aims
 - ❖ RER, FWHM, ER slope (and SNR ?) to
collect for the reference data set
 - ❖ Already available :

MEETING RESULTS

- Roadmap
 - Other metrics:
 - ❖ Already available :

	FWHM	RER	ER slope	SNR
SDSU				
ADS	To compute from LSF			
CSIR				x
DG				For 2 images
KARI	x	x	x	x
TELESPAZIO	x	x		x
ONERA				

MEETING RESULTS

- Roadmap
 - Other metrics:
 - ❖ Already available : not sufficient for the reference dataset
 - ❖ To complete :
 - ❖ At least for metrics included in the GIQE: (GSD), RER, SNR ?
 - ❖ Check for definitions consistency, particularly for SNR:
 - ❖ **Action** for the MTF team: send definition used to Françoise and to the other members of the MTF group
 - ❖ **Action** for Françoise: ask Emma Woolliams the definition(s) she has
 - ❖ **Action** for the MTF team: discuss about the definitions and report to Emma

MEETING RESULTS

- Roadmap
 - Other metrics:
 - ❖ Complements: focused on parameters used in the GIQE

	FWHM	RER	ER slope	SNR
SDSU				
ADS	To compute from LSF	To provide		To provide
CSIR	To provide	To provide		x
DG				For 2 images
KARI	x	x	x	x
TELESPAZIO	x	x		x
ONERA	To provide	To provide		To provide

MEETING RESULTS

➤ Roadmap

- GIQE (version 5):

$$NIIRS = A_0 + A_1 * \text{Log}_{10}(GSD) + A_2 * [1 - \exp(-A_3 / SNR)] * \text{Log}_{10}(RER) + A_4 * \text{Log}_{10}(RER)^4 + A_5 / SNR$$

- ❖ Renaud Fraisse's suggestion: Could CEOS issue a recommendation/understanding of the NIIRS in order to harmonize its use?

DISCUSSION

➤ Roadmap

- ❖ Renaud Fraisse's suggestion: Could CEOS issue a recommendation/understanding of the NIIRS in order to harmonize its use?
 - ❖ **IVOS answer:**
 - OK / field of IVOS as far as dedicated to space-borne imagery
 - Verify that it is not done by other people:
 - **Action** for Cody Anderson: ask to Greg Stensaas (USGS)
 - **Action** for others: think about other contacts and check thanks to bibliography
 - ❖ Once verification is done, if relevant, define and dispatch the work (**action** for Françoise with MTF team)

THANKS TO THE MTF WORKSHOP PARTICIPANTS

♥
PAF

