CEOS IVOS 30

Level 2 Validation

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U.S. Department of the Interior
U.S. Geological Survey

Outline

- **Introduction**
- **ECCOE Level 2 Validation Activities**
  - Landsat 8 Results
  - Landsat 7 Results
- **Conclusions**
- **Discussion**

Introduction

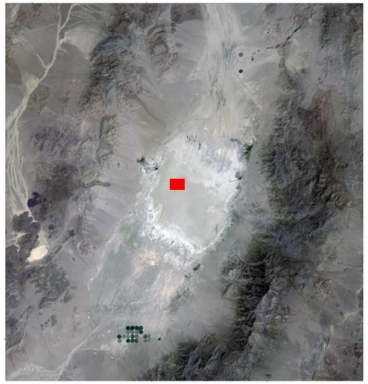
- **The standard data product produced at USGS EROS today is the L1T.**
- **The Landsat Science Team has recommended moving to Level 2 surface reflectance and surface temperature standard products.**
- **At ECCOE workshop on Cross Cal of Landsat 8 and Sentinel 2, the application panel members suggested CalVal validate L2 products.**
- **The EROS CalVal team has been tasked with validating these products.**

Introduction (Cont.)

- **Several sites already routinely monitored.**
  - Railroad Valley, Brookings, Salton Sea, Lake Tahoe, Buoys
  - La Crau, Baotau, Gobabeb
- **Several other sites with limited/one time studies**
  - Algodones Dunes (US), Tuz Golu (Turkey), Bahia (Brazil), Atacama (Chile)

- **Is this enough? Need to expand number of sites and/or land cover types / geographic locations?**

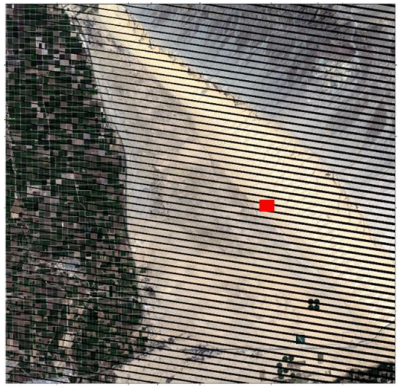
ECCOE Level 2 Validation Activities



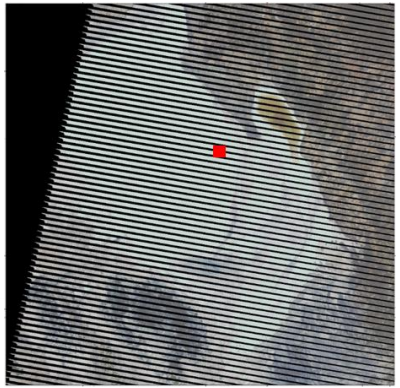
Railroad Valley

La Crau

Brookings

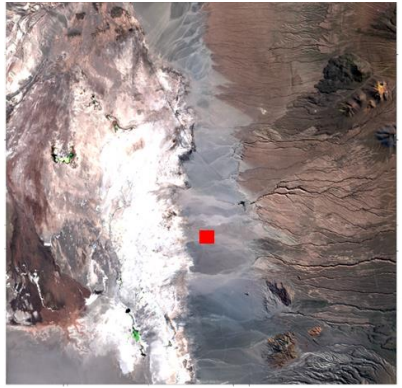


Algodones Dunes



Tuz Golu

Brazil

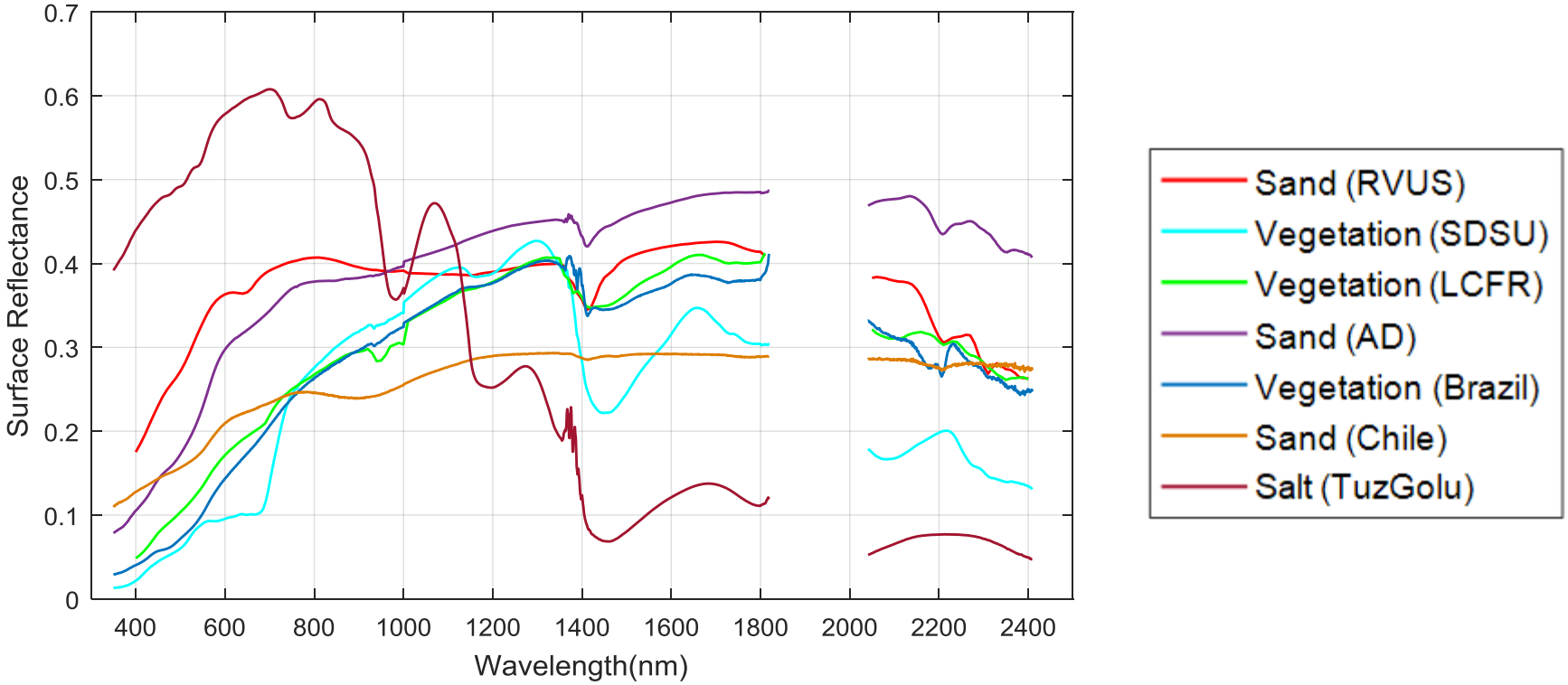


Chile

ECCOE Level 2 Validation Activities (Cont.)

Site	Sensor	#Collects	Time Period
Railroad Valley	Landsat 7	13	2015-2017
	Landsat 8	10	2015-2017
La Crau	Landsat 7	6	2015-2017
	Landsat 8	7	2015-2017
Brookings	Landsat 7	44	2002-2017
	Landsat 8	14	2013-2017
Algodones Dunes	Landsat 7	1	2015/03/10
Tuz Golu	Landsat 7	1	2010/08/19
Brazil	Landsat 8	1	2014/07/25
Chile	Landsat 8	1	2014/08/13

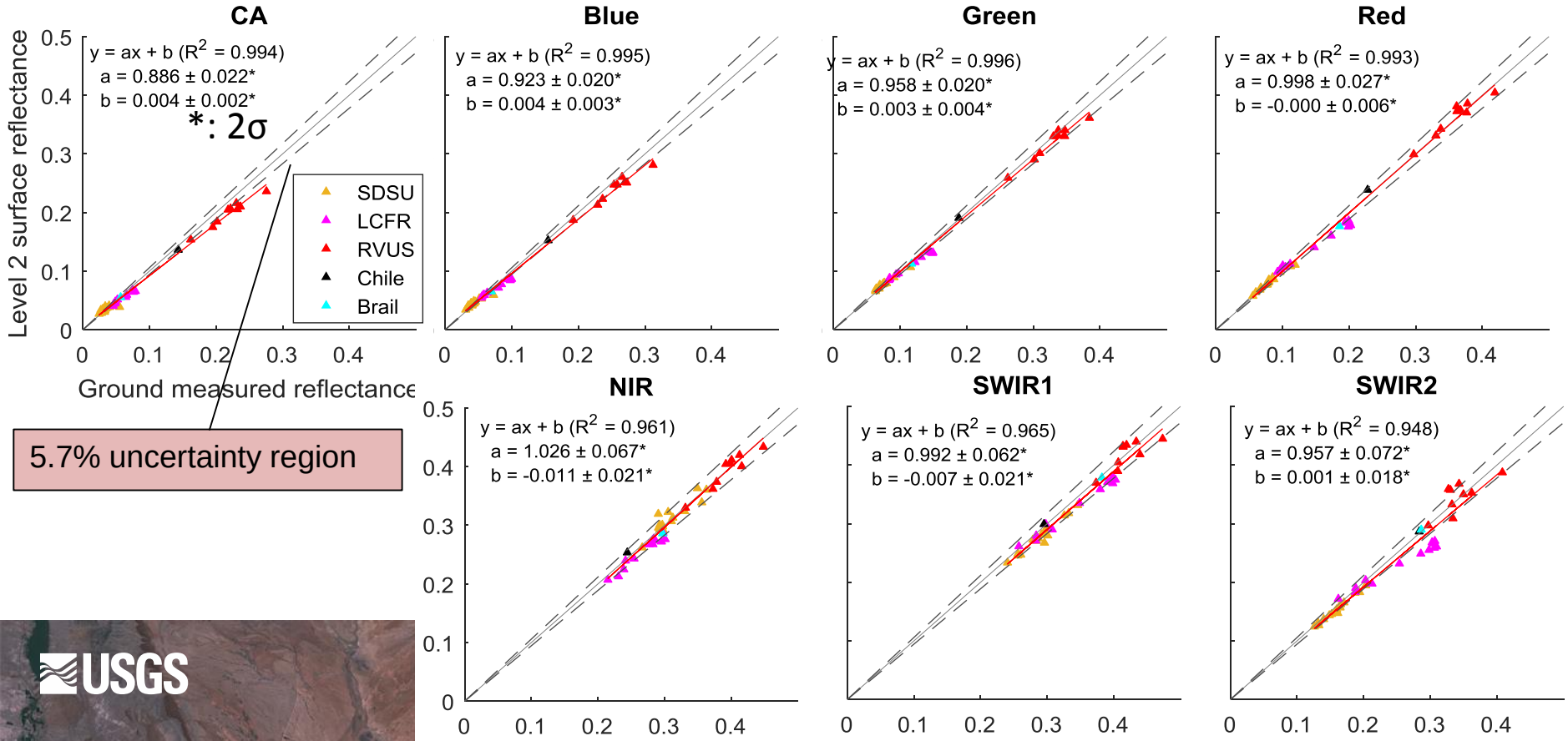
Ground Hyperspectral Measurements



Uncertainty Estimation of Level 2 Products

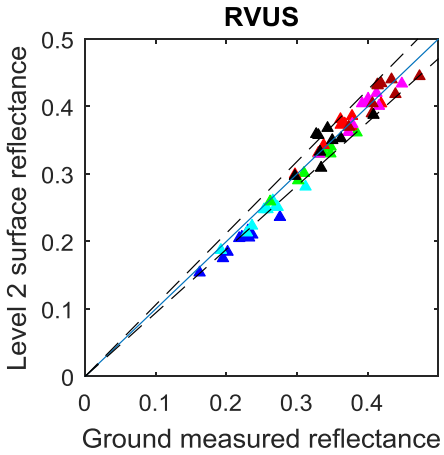
Uncertainty	TOA reflectance	RT model	Atmosphere parameters	Ground measurement	Total
Landsat 7 ETM+	5%	2%	4%	2%	**7.0%**
Landsat 8 OLI	3%	2%	4%	2%	**5.7%**

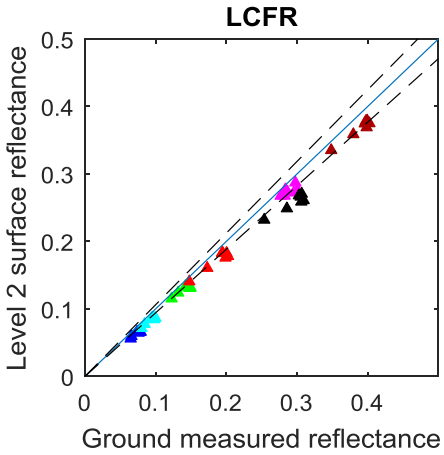
Landsat 8: Level 2 vs. Ground Truth

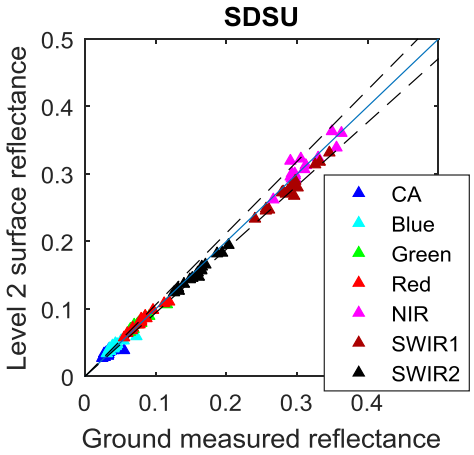


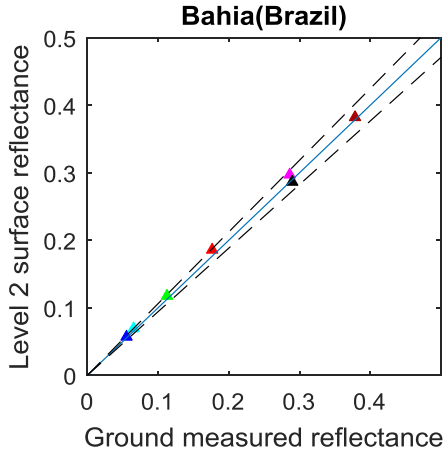
USGS

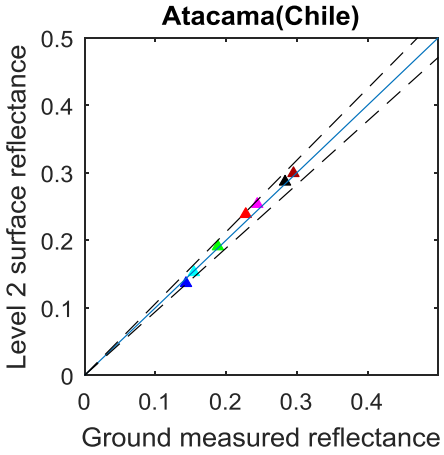
Landsat 8: Level 2 vs. Ground Truth



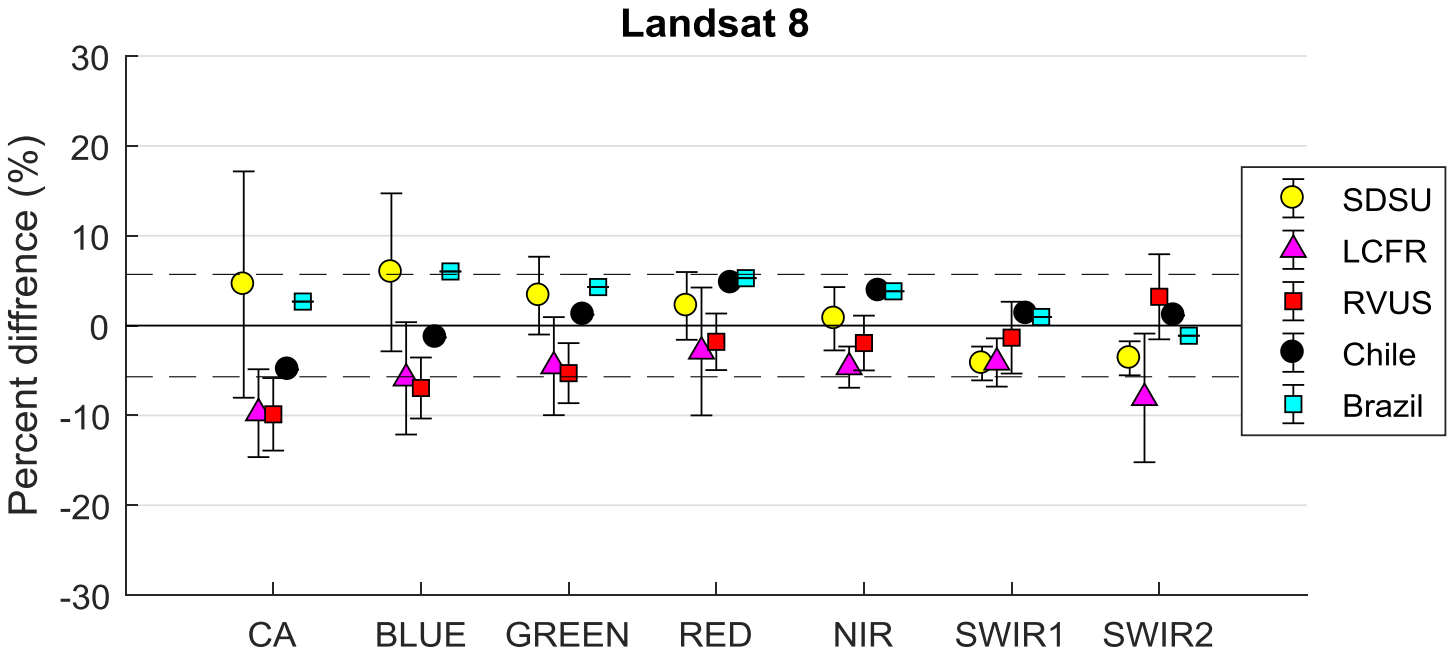




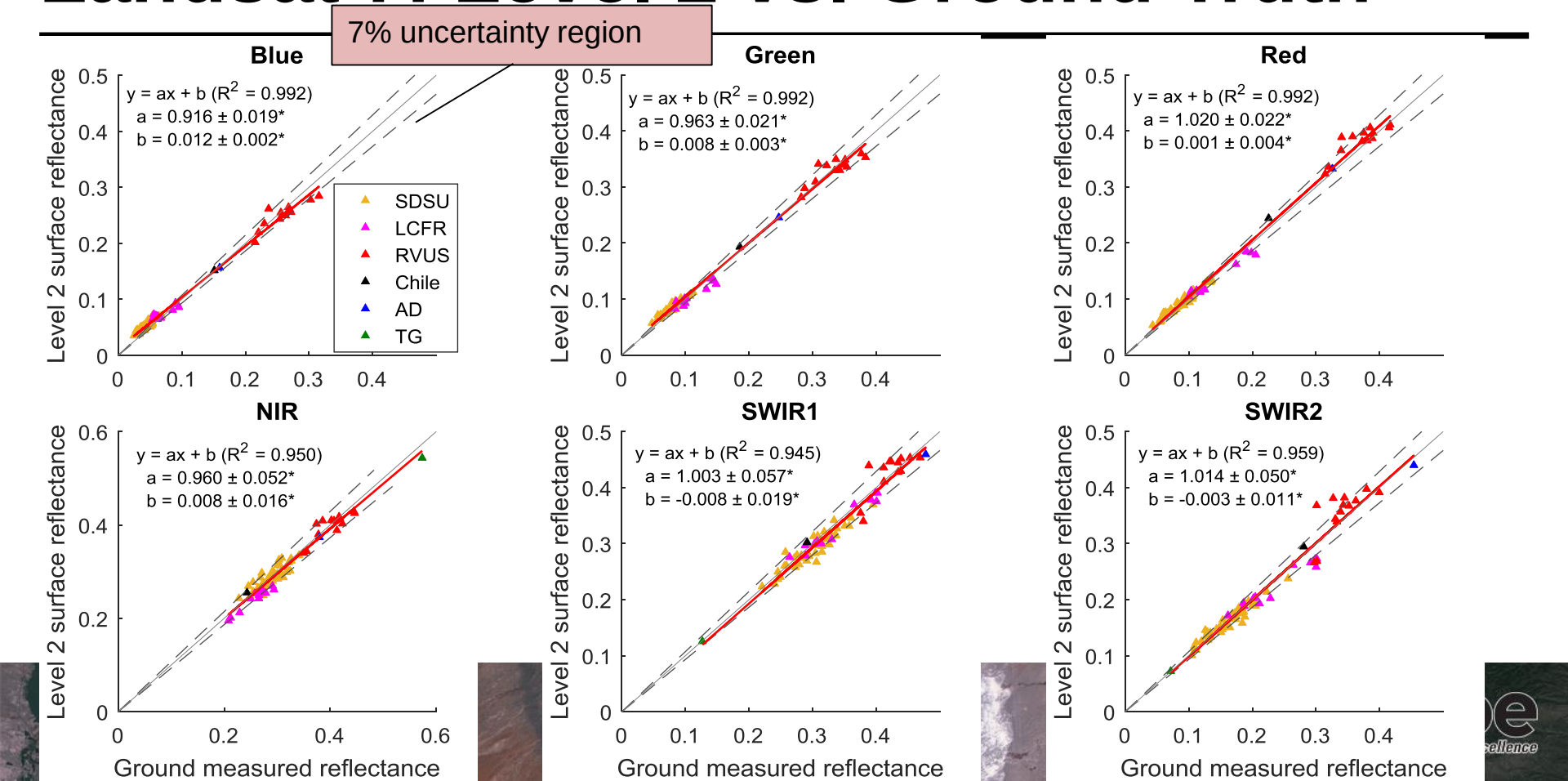




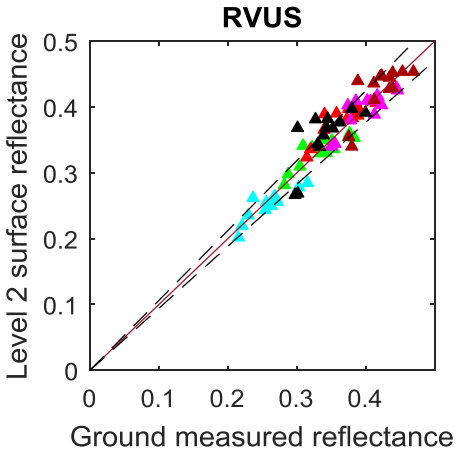
Landsat 8: Percent Difference

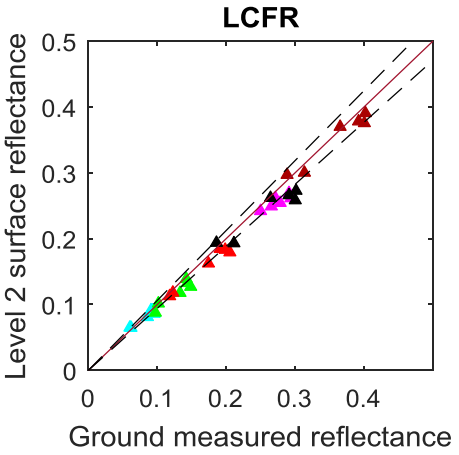


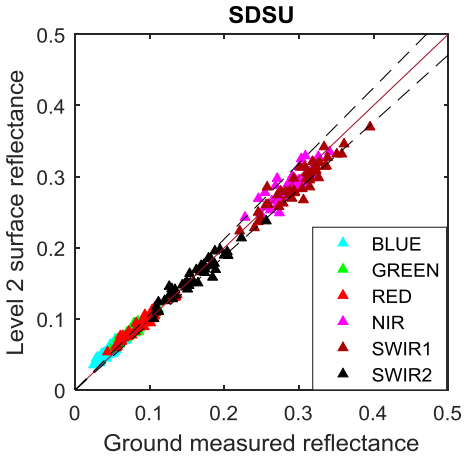
Landsat 7: Level 2 vs. Ground Truth

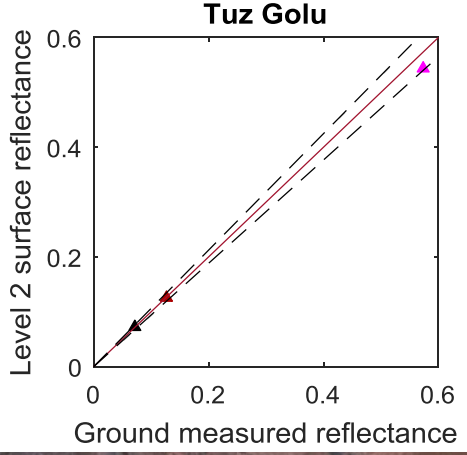


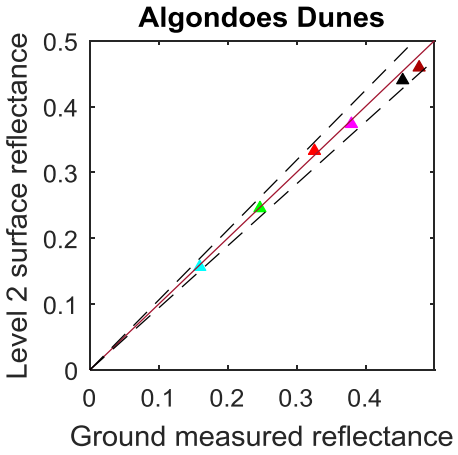
Landsat 7: Level 2 vs. Ground Truth

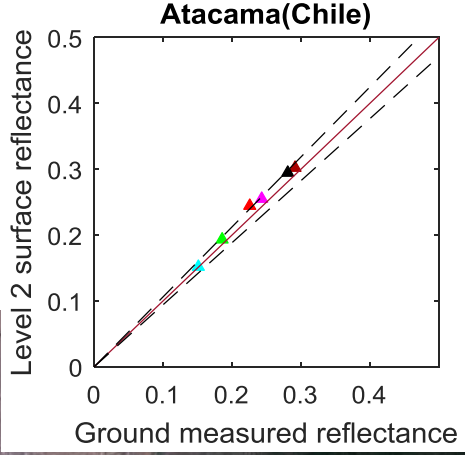




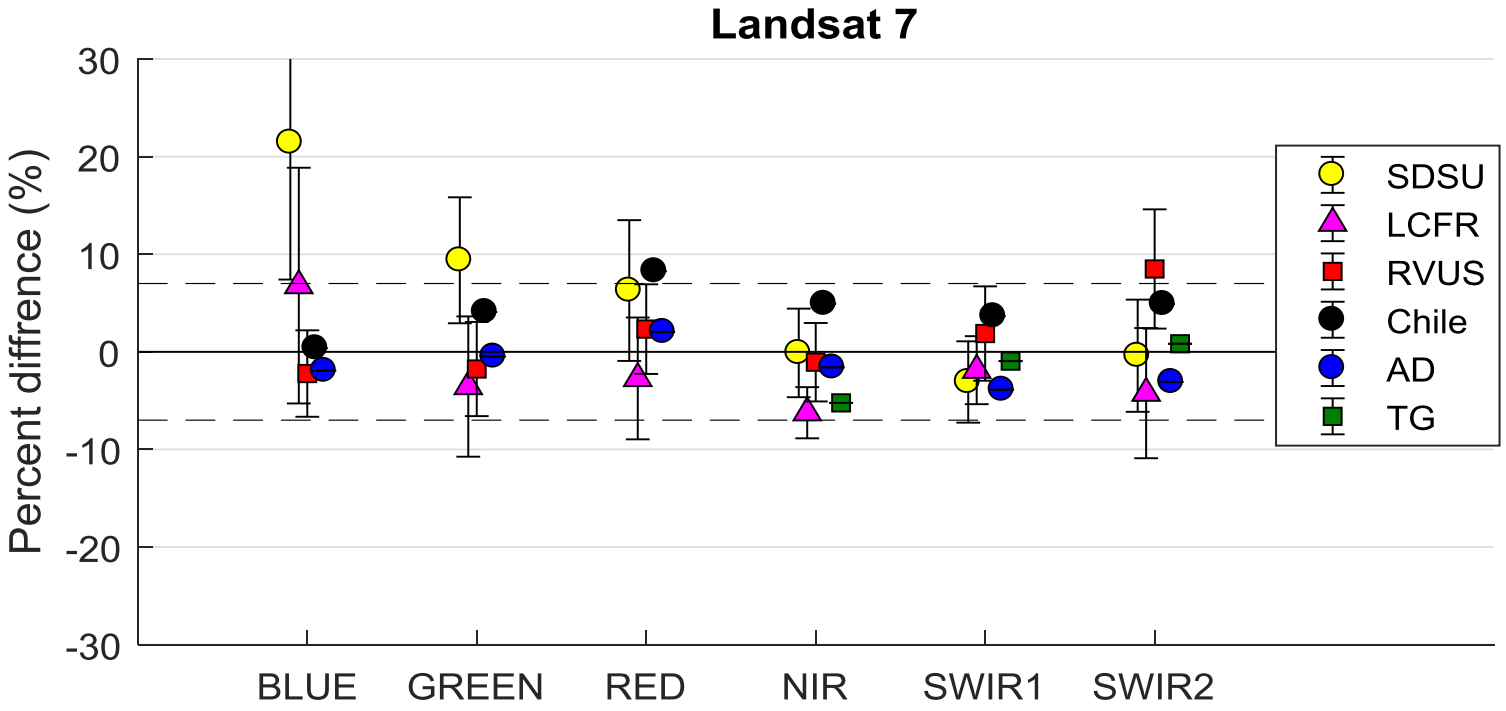








Landsat 7: Percent Difference



Conclusions

- **Both Landsat 8 and 7 agree well for the most part**
  - Larger errors in CA and Blue bands as expected
  - Larger errors for Landsat 7 as expected
  - L7 and L8 use different Surface Reflectance
- **No noticeable differences in trends between different sites**
  - La Crau ground measurement biased lower than the product
- **Previous discussions with European and Australian agencies suggest a global push/desire for Level 2 validation**
  - Possibilities for sharing ground measurement data
    - Field Teams (Australia), Hypernets (EU 2022)

Discussion

- **Other efforts currently/previously or soon to be underway?**
- **How/who to coordinate the efforts?**
- **Is this a role for IVOS?**
  - Should this become a working group under IVOS?
- **How to coordinate with LPV (Land Product Validation) CEOS WGCV subgroup?**