Soil Moisture
Active Passive
Mission
SMAP

The 6th SMAP Cal/Val Workshop
September 1-3, 2015
Columbia, MD

Status of Core and Candidate Validation Sites
Andreas Colliander
JPL, Caltech

In Situ Data Transfer Readiness: Core Sites

Black circles: Near real-time data access established
No circle: Near real-time data access being established
Grey circles: No near real-time data access available (data available at the end of Cal/Val Phase)
Grey triangles: installations on-going, but expected to provide useful data at some point during the Cal/Val Phase
Cal/Val Partner Data Transfer
Readiness for Soil Moisture Supplemental Networks

• Automated transfers from sparse networks:
  - USCRN – done
  - SCAN – done
  - SMOSMANIA – done
  - Murrumbidgee – done
  - SAOCOM regional – done
  - Oklahoma Mesonet – being implemented
  - NEON – once installed

• Automated transfers from sparse networks utilizing alternative measurement techniques
  - GPS – done
  - COSMOS – done
In situ data transfer status:
SM Core Site Candidates

- Automated transfers running

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In situ data transfer status: SM Core Site Candidates

- Automated pull ready to start

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- Initials setup but some further details need to be worked out

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- Work needed

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- Automation not expected

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Soil moisture core site data transfers

Most of the soil moisture transfers coming along as planned

Updated on 9/2/2015
In situ data transfer status: FT

- Automated pull running

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- Automated pull ready to start

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### NEE Partner Status

#### Done/Ready

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#### Data format and server need to be clarified
Soil Moisture Core/Candidate Review

Core definition:
- a: at least three stations
- b: at least five stations
- c: at least nine stations
…or supplemental analysis to increase the confidence in scaling

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Total number of pixels: 13 27 13 23 21 19
Total number of sites: 8 14 13 17 16 16
## 36-km SM Core Sites

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## 3-km SM Core Sites

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Global Coverage of SM Core Sites

• Question: how well the core sites represent the global diversity of climate and land cover conditions?

• Coverage evaluated with respect to
  1. Land cover types
     • IGBP land cover
  2. Climate classes and
     • Koeppen-Geiger land classification scheme

• The candidate sites divided into two categories
  – Core (selected as core site)
    • Provides concurrent updates of the data (the exact requirement?)
    • Quality of the data meets the minimum standard
    • Scaling function established
  – Candidate
    • Latency
    • Developing level of quality
    • Installations on-going
Global Coverage of Soil Moisture Sites
## Global Coverage of Soil Moisture Sites

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*) excluding forest, permanent ice, urban and wetlands
Global Coverage of SM core sites: Climate Classes

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Spatial Scaling (36 km)

- Default scaling based on Voronoi diagrams
- Other approaches:
  - Soil type based
  - Inverse distance weighting based
  - Straight average
Soil Moisture Core and Candidate Site Walk-Through
Tonzi Ranch (Candidate Pixel)

2501-36-01
Displaced ref pixel over Tonzi Ranch CA

USA (California)
Lat: 38.47, Lon: -121.00
PI: Mahta Moghaddam

Climate class:
Temperate (Csa)

Dominant landcover:
Grasslands

Soil texture:
S-%: 42
C-%: 20
BD: 1.61

Clay fraction
Climate class: Temperate (Csa)
Landcover: Grasslands

Soil texture:
S-%: 42
C-%: 20
BD: 1.61

L2_SM_P-Opt 2 (T11880-999): 2501-36-01 (Tonzi Ranch) (38.47, -121.00; -1896, -920)

Optional Algorithms

Tonzi Ranch (Candidate Pixel)
Reynolds Creek (Core Pixel)

0401-36-01
Displaced ref pixel Reynolds Creek ID (scaling by M. Cosh)

USA (Idaho)
Lat: 43.14, Lon: -116.76
PI: Mark Seyfried

Climate class: Arid (BSk)
Dominant landcover: Grasslands

Soil texture:
S-%: 37
C-%: 26
BD: 1.41

Clay fraction
Climate class: Arid (BSk)
Landcover: Grasslands

Soil texture:
S-%: 37
C-%: 26
BD: 1.41

Optional Algorithms

Reynolds Creek (Core Pixel)
USA (Arizona)
Lat: 31.68, Lon: -110.04
PI: Michael Cosh

Climate class:
Arid (BSk)

Dominant landcover:
Shrub open

Soil texture:
S-%: 44
C-%: 19
BD: 1.34

Clay fraction
Climate class: Arid (BSk)
Landcover: Shrub open

Soil texture:
S-%: 44
C-%: 19
BD: 1.34

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
USA
Lat: 30.31, Lon: -98.78
PI: Todd Caldwell

Climate class:
Temperate (Cfa)
Dominant landcover:
Grasslands

Soil texture:
S-%: 33
C-%: 33
BD: 1.42

Clay fraction
Climate class: Temperate (Cfa)
Landcover: Grasslands

Soil texture:
S-%: 33
C-%: 33
BD: 1.42

L2_SM_P-Opt 2 (T11880-999): 4801-36-01 (TxSON) (30.31, -98.78; 218, 101)

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
USA (Oklahoma)
Lat: 35.42, Lon: -98.62
PI: Michael Cosh

Climate class:
Temperate (Cfa)
Dominant landcover:
Grasslands
Soil texture:
S-%: 35
C-%: 18
BD: 1.44
Climate class: Temperate (Cfa)
Landcover: Grasslands

Soil texture:
S-%: 35
C-%: 18
BD: 1.44

Fort Cobb (Core Pixel)

L2_SM_P-Opt 2 (T11880-999): 1603-36-01 (Fort Cobb) (35.42, -98.62; -2616, -1024)

Optional Algorithms

Fort Cobb (Core Pixel)
Little Washita (Core Pixel)

1602-36-01
Displaced ref pixel over Little Washita OK (scaling by M. Cosh)

USA (Oklahoma)
Lat: 34.88, Lon: -98.09
PI: Michael Cosh

Climate class:
Temperate (Cfa)

Dominant landcover:
Grasslands

Soil texture:
S-%: 51
C-%: 16
BD: 1.44

Clay fraction
Climate class: Temperate (Cfa)
Landcover: Grasslands

Little Washita (Core Pixel)

L2_SM_P-Opt 2 (T11880-999): 1602-36-01 (Little Washita) (34.88, -98.09; -2632, -1042)

Soil texture:
S-%: 51
C-%: 16
BD: 1.44

Optional Algorithms

Little Washita (Core Pixel)
USA (Iowa)
Lat: 42.47, Lon: -93.39
PI: Michael Cosh

South Fork (Core Pixel)
1607-36-01
Displaced ref pixel over South Fork IA (scaling by M. Cosh)

Climate class:
Cold (Dfa)

Dominant landcover:
Croplands

Soil texture:
S-%: 37
C-%: 30
BD: 1.35

Clay fraction
Climate class: Cold (Dfa)  
Landcover: Croplands

Soil texture:  
S\%: 37  
C\%: 30  
BD: 1.35

South Fork (Core Pixel)

L2_SM_P-Opt 2 (T11880-999): 1607-36-01 (South Fork) (42.47, -93.39; -2784, -790)

Black: Use recommended [Retrieval Quality Flag bit(0)=0]  
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]  
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]  
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]  

Precip [mm/day]

Optional Algorithms

Correlation Coefficient

ubRMSE: 0.066  
RMSE: 0.098  
Bias: -0.072  
R: 0.643  

ubRMSE: 0.055  
RMSE: 0.098  
Bias: -0.079  
R: 0.569  

Reference Pixel VSM [m^3/m^3]  
Retrieved VSM [m^3/m^3]
Displaced ref pixel over St. Joseph's IN (scaling by M. Cosh)

USA (Indiana)
Lat: 41.40, Lon: -85.02
PI: Michael Cosh

Climate class:
Cold (Dfa)

Dominant landcover:
Croplands

Soil texture:
S-%: 30
C-%: 26
BD: 1.39

Clay fraction
Climate class: Cold (Dfa)
Landcover: Croplands

Soil texture:
S-%: 30
C-%: 26
BD: 1.39

St Josephs (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 1606-36-01 (St Josephs) (41.40, -85.02; -3052, -824)

Optional Algorithms

Correlation Coefficient

Standard deviation

DB4A-V

SCA-H

SCA-V

In Situ

Precip [mm/day]

ubRMSE: 0.043
RMSE : 0.078
Bias : -0.065
R : 0.647

ubRMSE: 0.047
RMSE : 0.076
Bias : -0.060
R : 0.413

Reference Pixel VSM [m^3/m^3]

Retrieved VSM [m^3/m^3]
USA (Georgia)
Lat: 31.60, Lon: -83.59
PI: Michael Cosh

Little River (Core Pixel)
1604-36-01
Displaced ref pixel over Little River GA (scaling by M. Cosh)

Climate class:
Temperate (Cfa)

Dominant landcover:
Cropland/natural mosaic

Soil texture:
S-%: 80
C-%: 7
BD: 1.47
Climate class: Temperate (Cfa)
Landcover: Cropland/natural mosaic

Little River (Core Pixel)

L2_SM_P-Opt 2 (T11880-999): 1604-36-01 (Little River) (31.60, -83.59; -3098, -1160)

Soil texture:
S-%: 80
C-%: 7
BD: 1.47

Optional Algorithms

In Situ  SCA-V  SMOS SM

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Kenaston (Core Pixel)

2701-36-01
Displaced ref pixel over Kenaston Canada; Thiessen Polygon

Canada
Lat: 51.45, Lon: -106.46
PI: Aaron Berg

Climate class:
Cold (Dfb)

Dominant landcover:
Croplands

Soil texture:
S-%: 32
C-%: 23
BD: 1.22

Clay fraction
Climate class: Cold (Dfb)
Landcover: Croplands

Soil texture:
S-%: 32
C-%: 23
BD: 1.22

Kenaston (Core Pixel)

L2_SM_P-Opt 2 (T11880-999): 2701-36-01 (Kenaston) (51.45, -106.46; -2364, -528)

Optional Algorithms
Kenaston (Core Pixel)
Carman (Core Pixel)

0901-36-01

Displaced ref pixel over Carman Canada; Soil type based weighting (A. Pacheco)

Canada
Lat: 49.61, Lon: -97.94
PI: Heather McNairn

Climate class:
Cold (Dfb)

Dominant landcover:
Croplands

Soil texture:
S-%: 23
C-%: 35
BD: 1.18

Clay fraction
Climate class: Cold (Dfb)
Landcover: Croplands

Soil texture:
S-%: 23
C-%: 35
BD: 1.18

Optional Algorithms
Carman (Core Pixel)

L2_SM_P-Opt 2 (T11880-999): 0901-36-01 (Carman) (49.61, -97.94; -2638, -578)

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]

Precip [mm/day]

Correlation Coefficient

Standard deviation

Retrieved VSM [m$^3$/m$^3$]

Reference Pixel VSM [m$^3$/m$^3$]
Tabasco (Candidate Pixel)

3201-36-01
Displaced ref pixel over Tabasco Mexico

Mexico
Lat: 17.81, Lon: -92.68
PI: Judith Ramos Hernandez

Climate class:
Tropical (Am)

Dominant landcover:
Croplands

Soil texture:
S-%: 38
C-%: 39
BD: 1.47

Clay fraction
Climate class: Tropical (Am)
Landcover: Croplands

Soil texture:
S-%: 38
C-%: 39
BD: 1.47

Tabasco (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 3201-36-01 (Tabasco) (17.81, -92.68; -2806, -1692)

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Monte Buey (Core Pixel)

1902-36-01

Displaced ref pixel at Monte Buey; Thiessen Polygon

Argentina
Lat: -32.96, Lon: -62.52
PI: Marc Thibeault

Climate class:
Temperate (Cwa)

Dominant landcover:
Croplands

Soil texture:
S-%: 24
C-%: 19
BD: 1.30

Clay fraction
Climate class: Temperate (Cwa)
Landcover: Croplands

Soil texture:
S-%: 24
C-%: 19
BD: 1.30

Monte Buey (Core Pixel)

**Optional Algorithms**

- Monte Buey (Core Pixel)

**Graphs and Statistics**

- Correlation Coefficient
- Standard Deviation
- Retrieved VSM vs Reference Pixel VSM

**Legend**

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Bell Ville (Candidate Pixel)

1901-36-01
Displaced ref pixel at Bell Ville; Thiessen Polygon

Argentina
Lat: -32.54, Lon: -62.61
PI: Marc Thibeault

Climate class:
Temperate (Cwa)

Dominant landcover:
Croplands

Soil texture:
S-%: 17
C-%: 22
BD: 1.30
Climate class: Temperate (Cwa)
Landcover: Croplands

Soil texture:
S-%: 17
C-%: 22
BD: 1.30

Bell Ville (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 1901-36-01 (Bell Ville) (-32.54, -62.61; -3772, -3748)

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Spain
Lat: 41.28, Lon: -5.41
PI: Jose Martinez-Frenandez

Climate class: Temperate (Csb)
Dominant landcover: Croplands
Soil texture:
S-%: 32
C-%: 32
BD: 1.38

Clay fraction
Climate class: Temperate (Csb)
Landcover: Croplands

Soil texture:
S-%: 32
C-%: 32
BD: 1.38

REMEDHUS (Core Pixel)
L2_SM_P-Opt 2 (T11880-999): 0301-36-02 (REMEDHUS) (41.28, -5.41; -5610, -828)

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Spain
Lat: 39.52, Lon: -1.21
PI: Ernesto Lopez-Baeza

Climate class:
Arid (BSk)

Dominant landcover:
Shrub open

Soil texture:
S-%: 28
C-%: 37
BD: 1.40

Clay fraction
Climate class: Arid (BSk)
Landcover: Shrub open

Soil texture:
S-%: 28
C-%: 37
BD: 1.40

Valencia (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 4101-36-01 (Valencia) (39.52, -1.21; -5746, -884)

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Austria
Lat: 48.16, Lon: 15.12
PI: Wouter Dorigo

Climate class:
Temperate (Cfb)

Dominant landcover:
Forest mixed

Soil texture:
S-%: 47
C-%: 18
BD: 1.31

Clay fraction
Climate class: Temperate (Cfb)
Landcover: Forest mixed

Soil texture:
S-%: 47
C-%: 18
BD: 1.31
Twente (Candidate Pixel)

1204-36-04
Ref pixel for Twente (for telemetered stations)

Holland
Lat: 52.09, Lon: 6.54
PI: Zhongbo Su

Climate class:
Temperate (Cfb)

Dominant landcover:
Cropland/natural mosaic

Soil texture:
S-%: 81
C-%: 6
BD: 1.23

Clay fraction
Climate class: Temperate (Cfb)
Landcover: Cropland/natural mosaic

Soil texture:
S-%: 81
C-%: 6
BD: 1.23

Optional Algorithms

Twente (Candidate Pixel)
Twente (Candidate Pixel)

1204-36-05
Ref pixel for Twente (for telemetered stations)

Holland
Lat: 52.09, Lon: 6.91
PI: Zhongbo Su

Climate class:
Temperate (Cfb)

Dominant landcover:
Cropland/natural mosaic

Soil texture:
S-%: 76
C-%: 8
BD: 1.21

Clay fraction
Climate class: Temperate (Cfb)
Landcover: Cropland/natural mosaic

Soil texture:
S-%: 76
C-%: 8
BD: 1.21

L2_SM_P-Opt 2 (T11880-999): 1204-36-05 (Twente) (52.09, 6.91; 501, 43)

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
TERENO (Candidate Pixel)

0201-36-01

Displaced ref pixel over Julich site (north); Thiessen Polygon

Germany
Lat: 51.00, Lon: 6.35
PI: Carsten Montzka

Climate class:
Temperate (Cfb)

Dominant landcover:
Croplands

Soil texture:
S-%: 41
C-%: 22
BD: 1.40

Clay fraction
Climate class: Temperate (Cfb)
Landcover: Croplands

Soil texture:
S-%: 41
C-%: 22
BD: 1.40

Optional Algorithms

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Sodankyla (Candidate Pixel)

1701-36-01
Displaced ref pixel over Sodankyla Finland

Finland
Lat: 67.28, Lon: 26.61
PI: Jouni Pulliainen

Climate class:
Cold (Dfc)

Dominant landcover:
Savannas woody

Soil texture:
S-%: 46
C-%: 26
BD: 1.03

Clay fraction
Climate class: Cold (Dfc)
Landcover: Savannas woody

Sodankyla (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 1701-36-01 (Sodankyla) (67.28, 26.61; -6640, -182)

Optional Algorithms

ubRMSE: 0.042
Bias : -0.035
RMSE : 0.055
R : 0.183

ubRMSE: 0.014
Bias : -0.328
RMSE : 0.328
R : 0.795

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]

Soil texture:
S-%: 46
C-%: 26
BD: 1.03
Kuwait
Lat: 29.34, Lon: 47.24
PI: Kota Rao

Kuwait (Candidate Pixel)
0501-36-01
Ref pixel over Kuwait (dummy scaling)

Climate class:
Arid (BWh)

Dominant landcover:
Barren/sparse

Soil texture:
S-%: 44
C-%: 17
BD: 1.54

Clay fraction
Climate class: Arid (BWh)
Landcover: Barren/sparse

Soil texture:
S-%: 44
C-%: 17
BD: 1.54

**Kuwait (Candidate Pixel)**

L2_SM_P-Opt 2 (T11880-999): 0501-36-01 (Kuwait) (29.34, 47.24; 609, 104)

Optional Algorithms
Niger (Candidate Pixel)

4501-36-01

Displaced ref pixel over Niger AMMA site

Niger
Lat: 13.59, Lon: 2.65
PI: Thierry Pellarin

Climate class:
Arid (BSh)

Dominant landcover:
Cropland/natural mosaic

Soil texture:
S-%: 90
C-%: 5
BD: 1.50
Climate class: Arid (BSh)
Landcover: Cropland/natural mosaic

Niger (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 4501-36-01 (Niger) (13.59, 2.65; -5870, -1864)

Soil texture:
S-%: 90
C-%: 5
BD: 1.50

Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Benin (Candidate Pixel)

4502-36-01

Displace ref pixel over Benin AMMA site

Benin
Lat: 9.77, Lon: 1.68
PI: Thierry Pellarin

Climate class:
Tropical (Aw)

Dominant landcover:
Savannas

Soil texture:
S-%: 50
C-%: 22
BD: 1.61
Climate class: Tropical (Aw)
Landcover: Savannas

Soil texture:
S-%: 50
C-%: 22
BD: 1.61

Optional Algorithms
Kenya
Lat: 0.38, Lon: 36.82
PI: Kelly Caylor

Climate class:
Temperate (Cfb)
Dominant landcover:
Grasslands
Soil texture:
S-%: 41
C-%: 42
BD: 1.36
Climate class: Temperate (Cfb)
Landcover: Grasslands

Soil texture:
- S-%: 41
- C-%: 42
- BD: 1.36

Optional Algorithms

Mpala (Candidate Pixel)
MAHASRI (Candidate Pixel)

5301-36-01
Displaced ref pixel in Mongolia (western)

Mongolia
Lat: 46.10, Lon: 106.40
PI: JAXA

Climate class:
Cold (Dwc)
Dominant landcover:
Grasslands
Soil texture:
S-%: 30
C-%: 32
BD: 1.36
Clay fraction
Climate class: Cold (Dwc)
Landcover: Grasslands

Soil texture:
S-%: 30
C-%: 32
BD: 1.36

MAHASRI (Candidate Pixel)

L2_SM_P-Opt 2 (T11880-999): 5301-36-01 (MAHASRI) (46.10, 106.40; -9204, -678)

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
Yanco (Core Pixel)
0701-36-01
Displaced ref pixel over Yanco

Australia
Lat: -34.85, Lon: 146.17
PI: Jeffrey Walker

Climate class:
Arid (BSk)

Dominant landcover:
Grasslands

Soil texture:
S-%: 43
C-%: 38
BD: 1.33

Clay fraction
Climate class: Arid (BSk)
Landcover: Grasslands

Soil texture:
S-%: 43
C-%: 38
BD: 1.33

Yanco (Core Pixel)
L2_SM_P-Opt 2 (T11880-999): 0701-36-01 (Yanco) (-34.85, 146.17; -10482, -3830)
Kyeamba (Core Pixel)

0702-36-01
Displaced ref pixel over Kyeamba

Climate class: Temperate (Cfa)
Dominant landcover: Grasslands

Soil texture:
S-%: 65
C-%: 18
BD: 1.43
Climate class: Temperate (Cfa)
Landcover: Grasslands

L2_SM_P-Opt 2 (T11880-999): 0702-36-01 (Kyeamba) (-35.36, 147.51; -10524, -3848)

Soil texture:
S-%: 65
C-%: 18
BD: 1.43

Optional Algorithms
Kyeamba (Core Pixel)

Black: Use recommended [Retrieval Quality Flag bit(0)=0]
Gray: Retrieval attempted and succeeded but use not recommended [bit(0)=1, bit(1)=0, bit(2)=0]
Green: Retrieval attempted but failed [bit(0)=1, bit(1)=0, bit(2)=1]
Cyan: Retrieval not attempted [bit(0)=1, bit(1)=1]
## L2_SM_P-Opt 2 (T11880-999)

2015/03/31 - 2015/09/02

### Metrics Summary: All Pixels

<table>
<thead>
<tr>
<th>Ref Pixel</th>
<th>ubRMSE</th>
<th>Bias</th>
<th>RMSE</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonzi Ranch (2501-36-01)</td>
<td>NaN</td>
<td>NaN</td>
<td>NaN</td>
<td>NaN</td>
</tr>
<tr>
<td>Reynolds Creek (0401-36-01)</td>
<td>0.050</td>
<td>-0.058</td>
<td>0.077</td>
<td>0.628</td>
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<tr>
<td>Walnut Gulch (1601-36-01)</td>
<td>0.040</td>
<td>0.005</td>
<td>0.041</td>
<td>0.471</td>
</tr>
<tr>
<td>TxSON (4801-36-01)</td>
<td>0.031</td>
<td>-0.010</td>
<td>0.032</td>
<td>0.962</td>
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<tr>
<td>Fort Cobb (1603-36-01)</td>
<td>0.044</td>
<td>-0.049</td>
<td>0.066</td>
<td>0.758</td>
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<tr>
<td>Little Washita (1602-36-01)</td>
<td>0.037</td>
<td>-0.050</td>
<td>0.062</td>
<td>0.833</td>
</tr>
<tr>
<td>South Fork (1607-36-01)</td>
<td>0.066</td>
<td>-0.072</td>
<td>0.098</td>
<td>0.643</td>
</tr>
<tr>
<td>St Josephs (1606-36-01)</td>
<td>0.043</td>
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<tr>
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<td>0.027</td>
<td>0.062</td>
<td>0.068</td>
<td>0.800</td>
</tr>
<tr>
<td>Kenaston (2701-36-01)</td>
<td>0.023</td>
<td>-0.111</td>
<td>0.113</td>
<td>0.828</td>
</tr>
<tr>
<td>Carman (0901-36-01)</td>
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<td>Tabasco (3201-36-01)</td>
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<tr>
<td>Monte Buey (1902-36-01)</td>
<td>0.045</td>
<td>-0.024</td>
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<td>0.813</td>
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<td>MAHASRI (5301-36-01)</td>
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<td>Yanco (0701-36-01)</td>
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<td>0.033</td>
<td>0.065</td>
<td>0.851</td>
</tr>
<tr>
<td>Kyeamba (0702-36-01)</td>
<td>0.039</td>
<td>0.022</td>
<td>0.045</td>
<td>0.921</td>
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L2_SM_P-Opt 2 (T11880-999)
2015/03/31 - 2015/09/02

Performance Metrics

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<th>ubRMSE</th>
<th>Bias</th>
<th>RMSE</th>
<th>R</th>
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<td>Reynolds Creek (0401-36-01)</td>
<td>0.050</td>
<td>-0.058</td>
<td>0.077</td>
<td>0.628</td>
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<td>Walnut Gulch (1601-36-01)</td>
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<td>0.005</td>
<td>0.041</td>
<td>0.471</td>
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<tr>
<td>Fort Cobb (1603-36-01)</td>
<td>0.044</td>
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<tr>
<td>Little Washita (1602-36-01)</td>
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<td>-0.050</td>
<td>0.062</td>
<td>0.833</td>
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<tr>
<td>South Fork (1607-36-01)</td>
<td>0.066</td>
<td>-0.072</td>
<td>0.098</td>
<td>0.643</td>
</tr>
<tr>
<td>Little River (1604-36-01)</td>
<td>0.027</td>
<td>0.062</td>
<td>0.068</td>
<td>0.800</td>
</tr>
<tr>
<td>Kenaston (2701-36-01)</td>
<td>0.023</td>
<td>-0.111</td>
<td>0.113</td>
<td>0.828</td>
</tr>
<tr>
<td>Carman (0901-36-01)</td>
<td>NaN</td>
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<td>NaN</td>
<td>NaN</td>
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<tr>
<td>Monte Buey (1902-36-01)</td>
<td>0.045</td>
<td>-0.024</td>
<td>0.051</td>
<td>0.813</td>
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<tr>
<td>REMEDHUS (0301-36-02)</td>
<td>0.038</td>
<td>-0.043</td>
<td>0.058</td>
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<td>Yanco (0701-36-01)</td>
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**MEAN:** 0.042 -0.026 0.068 0.750
Performance Metrics by Land Cover Class (IGBP)

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<th>Land Cover</th>
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<th>Bias</th>
<th>RMSE</th>
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<td>Cropland/natural mosaic</td>
<td>Little River</td>
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<td></td>
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<td>0.062</td>
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<td>0.800</td>
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<td>Croplands</td>
<td>South Fork</td>
<td>0.066</td>
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<td>0.113</td>
<td>0.828</td>
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<td>Carman</td>
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<td>Monte Buey</td>
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<td>-0.043</td>
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<td>0.077</td>
<td>0.628</td>
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<td></td>
<td>Fort Cobb</td>
<td>0.044</td>
<td>-0.049</td>
<td>0.066</td>
<td>0.758</td>
</tr>
<tr>
<td></td>
<td>Little Washita</td>
<td>0.037</td>
<td>-0.050</td>
<td>0.062</td>
<td>0.833</td>
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<tr>
<td></td>
<td>Yanco</td>
<td>0.056</td>
<td>0.033</td>
<td>0.065</td>
<td>0.851</td>
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<tr>
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<td>0.022</td>
<td>0.045</td>
<td>0.921</td>
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<td>Shrub open</td>
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<td>0.005</td>
<td>0.041</td>
<td>0.471</td>
</tr>
<tr>
<td></td>
<td>MEAN:</td>
<td>0.040</td>
<td>0.005</td>
<td>0.041</td>
<td>0.471</td>
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</tbody>
</table>