Soil Moisture
Active Passive
Mission
SMAP

Core Validation
Site Data Flow in
SMAP Cal/Val

3rd Cal/Val Workshop

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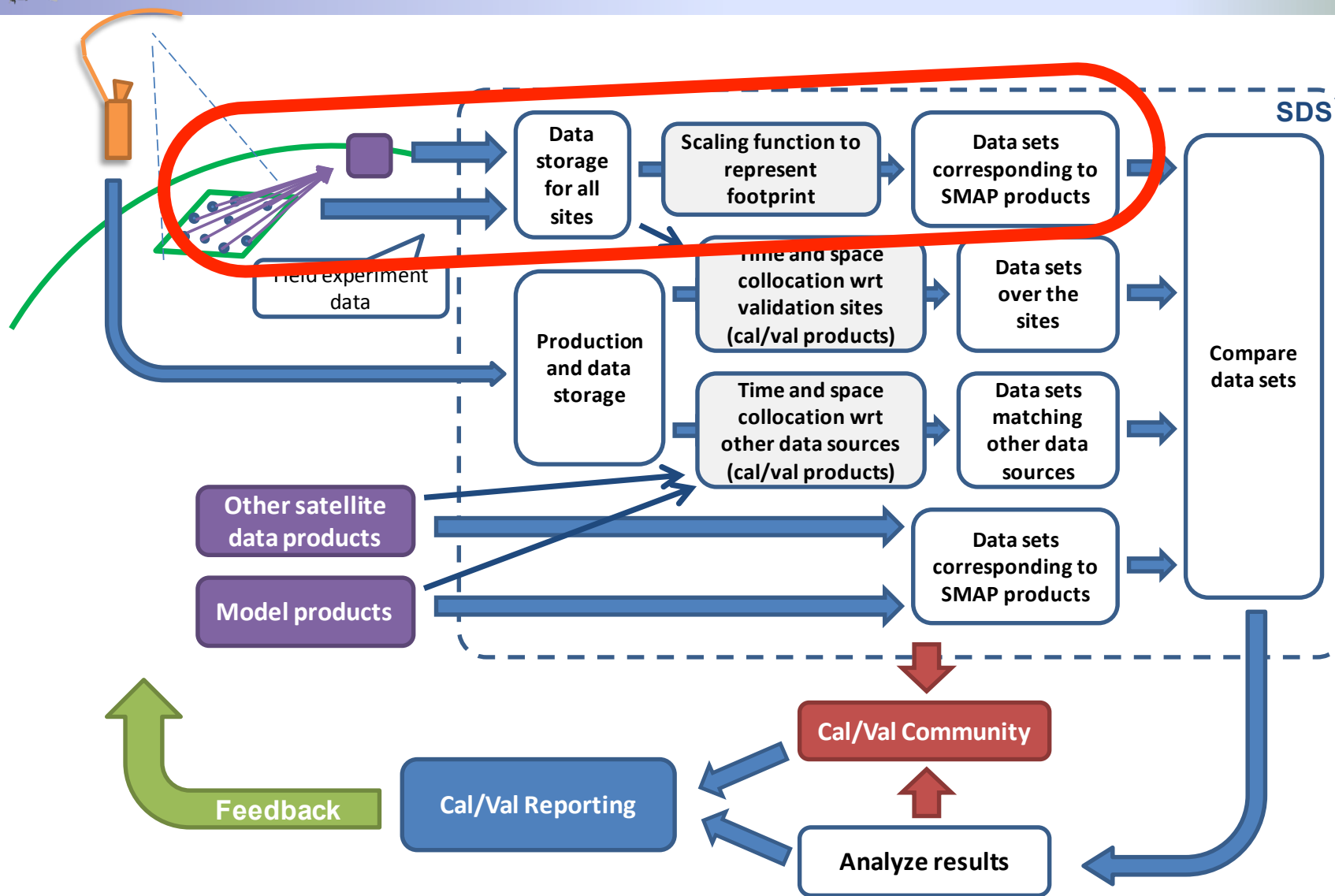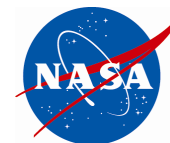Jet Propulsion Laboratory,
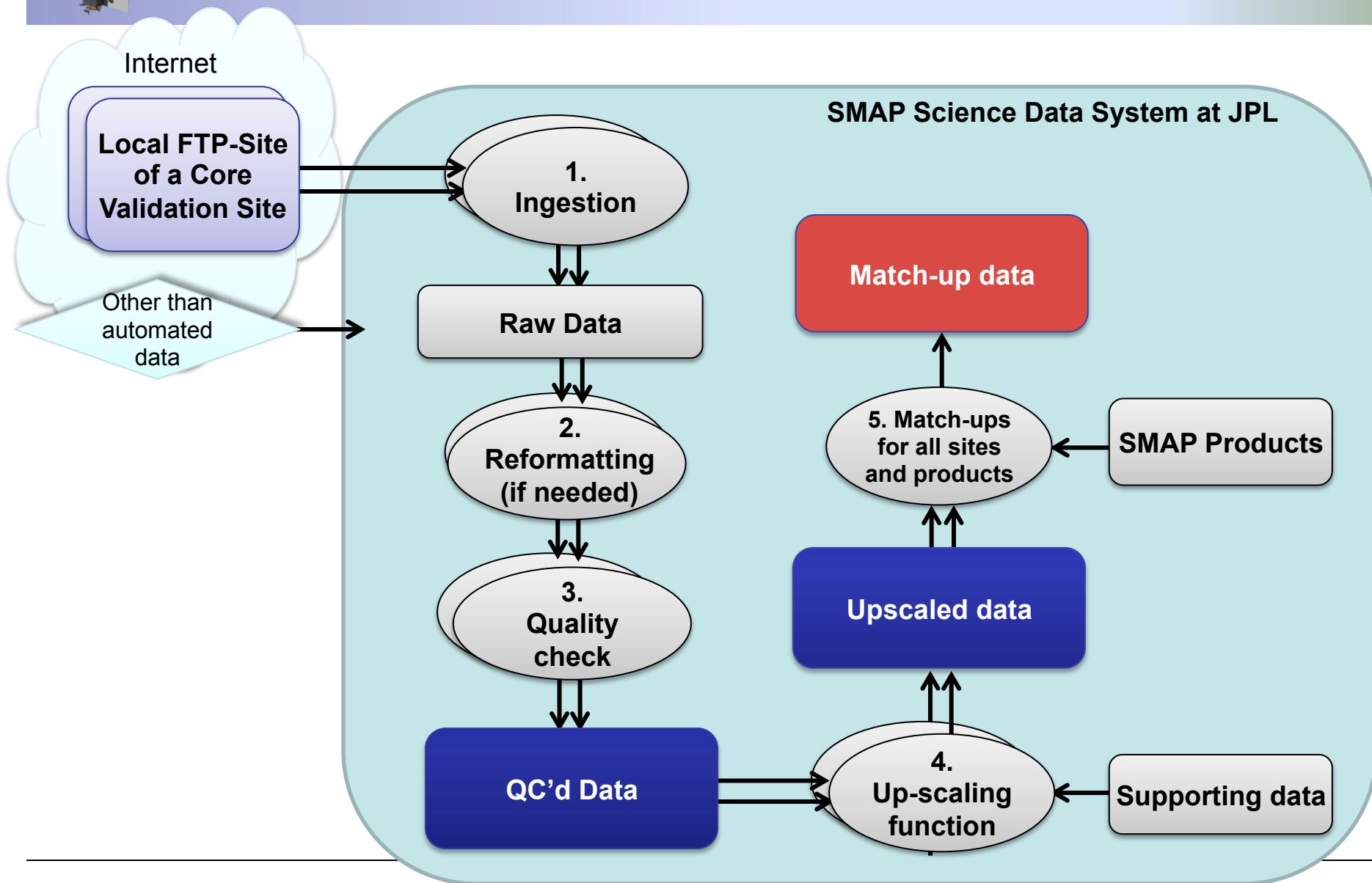California Institute of Technology

Soil Moisture Cal/Val Processing Flow: Core Validation Site Data Pre-processing

In Situ Data Flow for SMAP Data Product Calibration and Validation

Internet

Local FTP-Site of a Core Validation Site

Other than automated data

SMAP Science Data System at JPL

1. Ingestion

Raw Data

2. Reformatting (if needed)

3. Quality check

QC'd Data

4. Up-scaling function

Supporting data

Upscaled data

5. Match-ups for all sites and products

SMAP Products

Match-up data
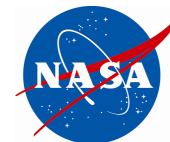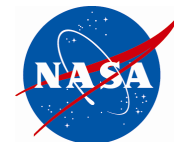
SMAP Cal/Val Tools

- In situ data processing tools
  1. *Ingestion tool*
     - Specifications for the source
  2. *Reformatting tool*
     - Original format (if different from the pre-defined format)
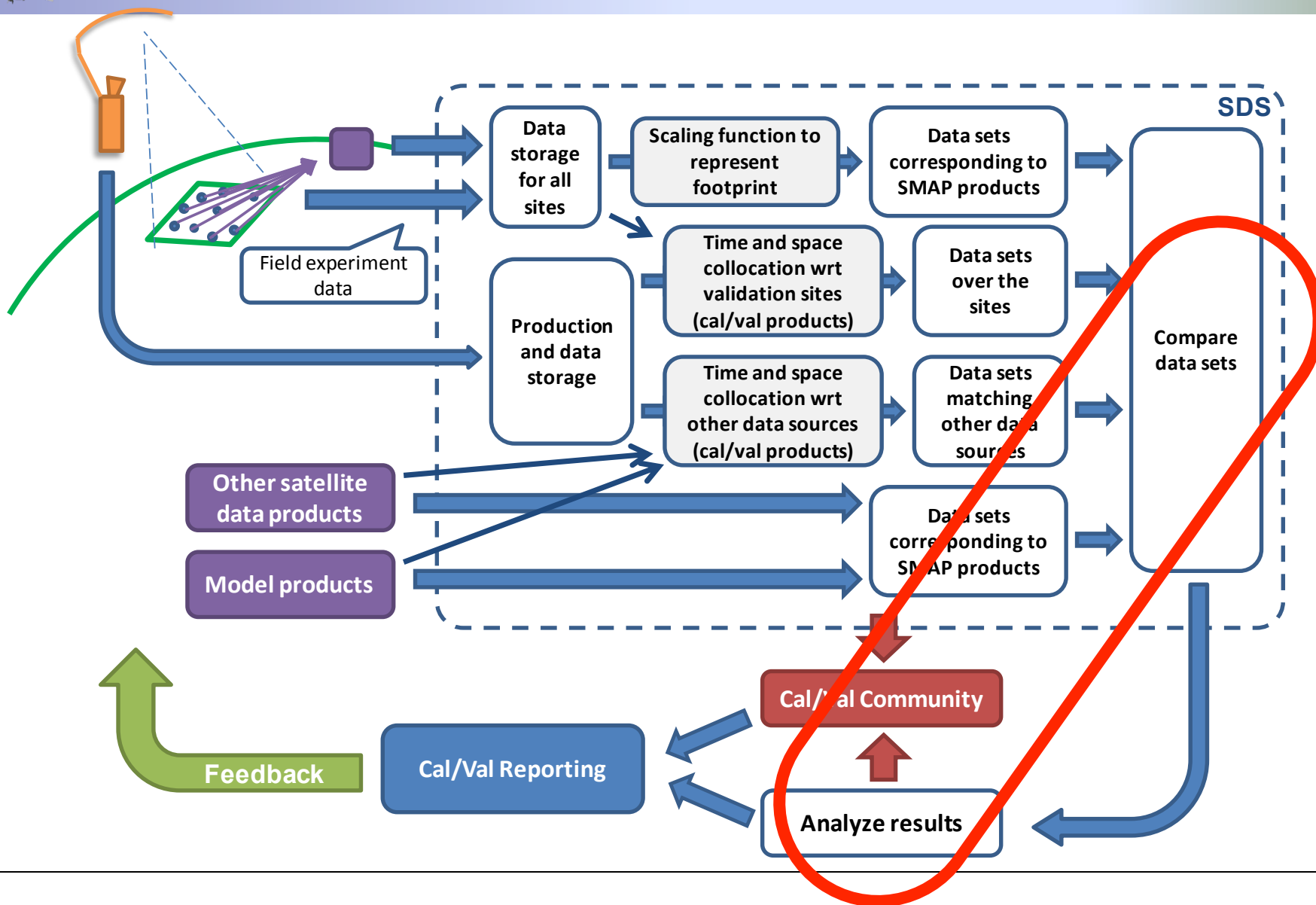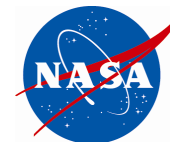 3. *Quality checking tool*
     - Some default tests
     - What is done by the provider?
  4. *Up-scaling tool*
     - Function defined for each site individually
     - Possible to have several up-scaled footprints within a site (geographically and product-wise)
  5. *Match-up tool*
     - Overpass time at site location

# Soil Moisture Cal/Val Processing Flow: Data Analysis and Reporting

Validation Using Core Validation Sites:
Baseline Sequence of Actions

Goal   Confirm soil moisture product meets 0.04 m3/m3 accuracy

Steps

1. Match up retrieved soil moisture with up-scaled core validation site ground data in time and space.
2. Inspect scatterplots and time series.
3. Compute RMSE, bias, and correlation for each core validation site.
4. Compute mean RMSE over all core validation site to get the metric.

Resolution of anomalies

When/where retrieval and observed data do not match well (not inclusive list):

- Inspect flags for anomalous surface conditions (e.g., rain, snow, high biomass, high topography, high water fraction within grid cell, etc.).
- Test alternate soil dielectric models.
  - Baseline is Mironov. Dobson and Wang are also available for testing.
- Test alternate soil temperature sources.
  - Baseline is GEOS-5. ECMWF, GLDAS, or NCEP can be acquired at small volume for regional study.
- Test alternate retrieval algorithms.
  - E.g. for L2_SM_P the baseline is SCA. LPRM and DCA are also available for testing.
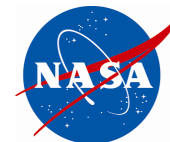
SMAP Cal/Val Tools

- Analysis tools
  - *Required tools*
    - Tool to provide validation metric against core validation sites (mean, rmse, correlation)
    - Tool to provide comparison with satellite and model products (triple-collocation)
    - Tool to visualize products and validation results
    - Cross-comparison between SMAP soil moisture products
  - *Support tools (not inclusive list)*
    - Identify the areas where the retrievals have not been compromised by the surface conditions (Precipitation, VWC, F/T, water bodies, Urban area)
    - Tools to select the known water bodies
    - Assess the threshold limits of conditions when algorithms meet soil moisture accuracy requirements
    - Cross calibrate against various ancillary information and land covers
    - Product specific airborne data pre-processing
    - Pattern mapping with other satellites (Aquarius, GCOM-W, SAOCOM, and SMOS)
    - Pattern mapping with land surface models (GEOS-5, NCEP, ECMWF)