



UFS Land Data Assimilation (DA) System Demo

By: Gillian Petro

Land DA System

- Based on the NOAH-MP land surface model
- Performs JEDI-based snow data assimilation
- Uses the Local Ensemble Transform Kalman Filter-Optimal Interpolation (LETKF-OI) algorithm
- Runs on Hera & Orion
 - Containers available for other systems

Resources

- [Land DA User's Guide](#)
- [GitHub Discussions](#)
- [Technical Documentation](#) (for NOAH-MP)
- [JEDI Documentation](#) (Skylab v7.0)
- [Land DA page](#) (EPIC website)
- [GitHub Wiki](#)
- [Data Bucket](#)

Land DA Forecast Experiment

- Default case:
 - NOAH-MP land component from ufs-weather-model
 - GSWP3 atmospheric forcing data
 - 2 cycles
 - 2000-01-03 00z case
 - spack-stack v1.6.0
 - JEDI Skylab v7.0
- Latest *develop* branch commit* at time of recording: 09f445e
 - *Note that a pull request for updated documentation may be merged by the time of this demo or shortly thereafter.

Cloning Land DA

- To clone the **develop** branch, run:

```
git clone -b develop --recursive
```

https://github.com/ufs-community/land-DA_workflow.git

- To clone the **v1.2.0 release** branch, run:

```
git clone -b release/public-v1.2.0 --recursive
```

https://github.com/ufs-community/land-DA_workflow.git

Workflow Tasks

UFS Offline Land DA User's Guide

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Search docs

CONTENTS:

- 1. Background Information
- 2. Building, Running, and Testing the Land DA System
 - 2.1. Land DA Workflow (Hera & Orion)
 - 2.1.1. Create a Working Directory
 - 2.1.2. Get Code
 - 2.1.3. Build the Land DA System
 - 2.1.4. Configure an Experiment
 - 2.1.5. Run the Experiment

2.1.5. Run the Experiment

2.1.5.1. Workflow Overview

Each Land DA experiment includes multiple tasks that must be run in order to satisfy the dependencies of later tasks. These tasks are housed in the `J-job` scripts contained in the `jobs` directory.

Table 2.2 J-job Tasks in the Land DA Workflow

J-job Task	Description
JLANDDA_PREP_OBS	Sets up the observation data files
JLANDDA_PRE_ANAL	Transfers the snow data from the restart files to the surface data files
JLANDDA_ANALYSIS	Runs <code>JEDI</code> and adds the increment to the surface data files
JLANDDA_POST_ANAL	Transfers the JEDI result from the surface data files to the restart files
JLANDDA_PLOT_STATS	Plots the JEDI result (scatter/histogram)
JLANDDA_FORECAST	Runs the forecast model

<https://land-da-workflow.readthedocs.io/en/develop/BuildingRunningTesting/BuildRunLandDA.html#run-the-experiment>

Directory Structure

```
$LANDDAROOT: Base directory
├── land-DA_workflow(<CYCLEDIR>): Home directory of the land DA workflow
├── ptmp (<PTMP>)
│   └── <envir> (<OPSRROOT>)
│       ├── com (<COMROOT>)
│       │   ├── landda (<NET>)
│       │   │   ├── vX.Y.Z (<model_ver>)
│       │   │   └── landda.YYYYMMDD (<RUN>.<PDY>): Directory containing the output files
│       │   │       ├── hofx
│       │   │       └── plot
│       │   └── output
│       │       └── logs
│       └── run_<forcing> (<LOGDIR>): Directory containing the log files for the Rocoto
└── tmp (<DATAROOT>)
    ├── <jobid> (<DATA>): Working directory
    └── DATA_SHARE
        ├── YYYYMMDD (<PDY>): Directory containing the intermediate or temporary files
        ├── hofx: Directory containing the soft links to the results of the analysis task for p
        └── DATA_RESTART: Directory containing the soft links to the restart files for the next
```

`<forcing>` refers to the type of forcing data used (`gswp3` or `era5`). Each variable in parentheses and angle brackets (e.g., `<VAR>`) is the name for the directory defined in the file `land_analysis.yaml` . In the future, this directory structure will be further modified to meet the [NCO Implementation Standards](#).

3.1.3.1. NCO Directory Structure Entities

HOMElandda: (Default: "&EXP_BASEDIR;/land-DA_workflow")

The location of the `land-DA_workflow` clone.

PTMP: (Default: "&EXP_BASEDIR;/ptmp")

User-defined path to the `com` -type directories.

envir: (Default: "test")

The run environment. Set to "test" during the initial testing phase, "para" when running in parallel (on a schedule), and "prod" in production.

COMROOT: (Default: "&PTMP;/&envir;/com")

`com` root directory, which contains input/output data on current system.

NET: (Default: "landda")

Model name (first level of `com` directory structure)

model_ver: (Default: "v1.2.1")

Version number of package in three digits (second level of `com` directory)

RUN: (Default: "landda")

Name of model run (third level of `com` directory structure). In general, same as `$(NET)`.

DATAROOT: (Default: "&PTMP;/&envir;/tmp")



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Plotting

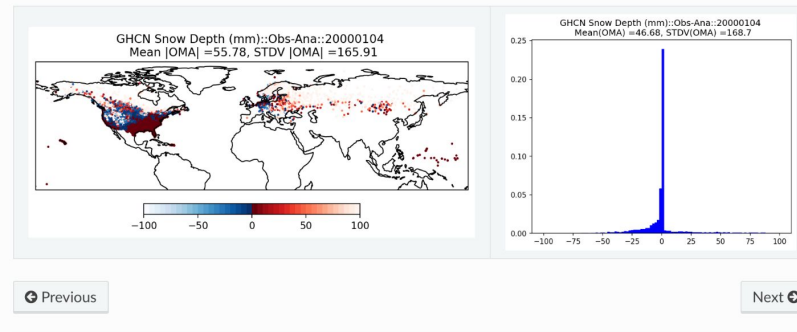
Default plotting directory:

`$LANDDA_ROOT/tmp/test/com/landda/v1.2.1/landda.YYYYMMDD/plot`
where `YYYYMMDD` is the cycle date. The experiment should generate several restart files.

2.1.5.3.1. Plotting Results

Additionally, in the `plot` subdirectory, users will find images depicting the results of the `analysis` task for each cycle as a scatter plot (`hofs_oma_YYYYMMDD_scatter.png`) and as a histogram (`hofs_oma_YYYYMMDD_histogram.png`). The scatter plot is named OBS-ANA (i.e., Observation Minus Analysis [OMA]), and it depicts a map of snow depth results. Blue points indicate locations where the observed values are less than the analysis values, and red points indicate locations where the observed values are greater than the analysis values. The title lists the mean and standard deviation of the absolute value of the OMA values. The histogram plots OMA values on the x-axis and frequency density values on the y-axis. The title of the histogram lists the mean and standard deviation of the real value of the OMA values.

Table 2.3 Snow Depth Plots for 2000-01-04



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Search docs

CONTENTS:

- 1. Background Information
- 2. Building, Running, and Testing the Land DA System
 - 2.1. Land DA Workflow (Hera & Orion)
 - 2.1.1. Create a Working Directory
 - 2.1.2. Get Code
 - 2.1.3. Build the Land DA System
 - 2.1.4. Configure an Experiment
 - 2.1.5. Run the Experiment
 - 2.1.5.1. Workflow Overview
 - 2.1.5.2. Run With Rocoto
 - 2.1.5.3. Check Experiment Output
 - 2.2. Containerized Land DA Workflow
 - 2.3. Testing the Land DA Workflow
- 3. Customizing the Workflow

Read the Docs v. develop



THANK YOU!