Application Research and Development Goals, Priorities, and Working Group Breakout Session

Group B

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UFS Applications

UFS applications include the following (BOLD are subject of this exercise):

- **Medium-Range Weather (Weather)** - Atmospheric behavior out to about two weeks
- **Subseasonal-to-Seasonal (S2S)** - Atmospheric and ocean behavior from about two weeks to about one year
- **Hurricane** - Hurricane track, intensity, and related effects out to about one week
- **Short-Range Weather/Convection Allowing** - Atmospheric behavior from less than an hour to several days
- **Space Weather** - Upper atmosphere geophysical activity and solar behavior out to about one month
- **Marine and Cryosphere** - Ocean and ice behavior out to about ten days
- **Coastal** - Storm surge and other coastal phenomena out to about one week
- **Air Quality** - Aerosol and atmospheric composition out to several days
Breakout Objectives

- Identify top 5-10 high-level forecast or model improvement goals for three core UFS applications: Medium-Range Weather, Subseasonal-to-Seasonal (S2S), and Short-Range Weather/ Convection Allowing
- Propose recommended research and development solutions: Science priorities to address forecast goals
- Propose any changes that may be needed for Working Groups to best support these applications
- Remember that the forecast goals and the science priorities form the basis of activities described in the next SIP (2020-2022).

Groups should consider the Science Priorities Worksheet initiated by the UFS Steering Committee to develop science and prediction priorities of the UFS
Forecast or model improvement Goals

Medium-Range Weather

● Reduce lower troposphere cold bias
● Reduce errors in 2m temperature & improve land model and DA
● Improve representation of boundary layer and low level inversions
● Better representation of tropical waves
● Connect microphysics and DA
● Representation of model uncertainty in DA, especially near land surface
● Optimize DA ensemble size and resolution
● Reduce stratospheric biases e.g. in temperature and circulation
● Improve parameterization of gravity wave breaking
Forecast or model improvement Goals

Subseasonal-to-Seasonal (S2S)

- Better representation cloud-radiation interaction and convective organization for tropical variability
- Include TOA radiation budget in evaluation
- Better representation of stratosphere, e.g. SSW
- Sea ice model improvement
- Coupling of components as a science problem
- Optimize ensemble size and the frequency of initialization
- and all medium range weather priorities
Forecast or model improvement Goals

Short-Range Weather/Convection Allowing

- Representation of PBL
- Collection of near-surface observations and DA - need multiple sites with comprehensive observations
- Prediction of convection initiation
- Prediction of storm environment
- Storm motion (tends to be too fast)
- Improve microphysics
- Satellite DA and channel selection due to lower model top
- Gravity waves in non-hydrostatic model
Research/Development Actions/Solutions

Strengthen collaboration within the community

Medium-Range Weather

1) Improve connection between microphysics and DA
2) Improve use all-sky radiances in DA
3) Coordination of land and atm physics development
4) Run weather model to seasonal scales to identify biases
5) Better collaboration with data providers on observations for process-oriented diagnostics (e.g. surface heat flux)

Subseasonal-to-Seasonal (S2S)

1) Hierarchical testing of components
2) Continuous testing of the coupled system
3) Long simulation to identify biases and drift

Short-Range Weather/Convection Allowing

1) Hierarchical testing framework and process-oriented diagnostics
2) Take advantage of available observations
Proposed UFS WG Changes

Medium-Range Weather

*did not discuss this topic*

Subseasonal-to-Seasonal (S2S)

*did not discuss this topic*

Short-Range Weather/Convection Allowing

*did not discuss this topic*