

Student Scholarship

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Crop Monitoring and Nutrient Prediction Using Satellite Imagery and Soil Data

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Crop Monitoring and Nutrient Prediction Using Satellite Imagery and Soil Data

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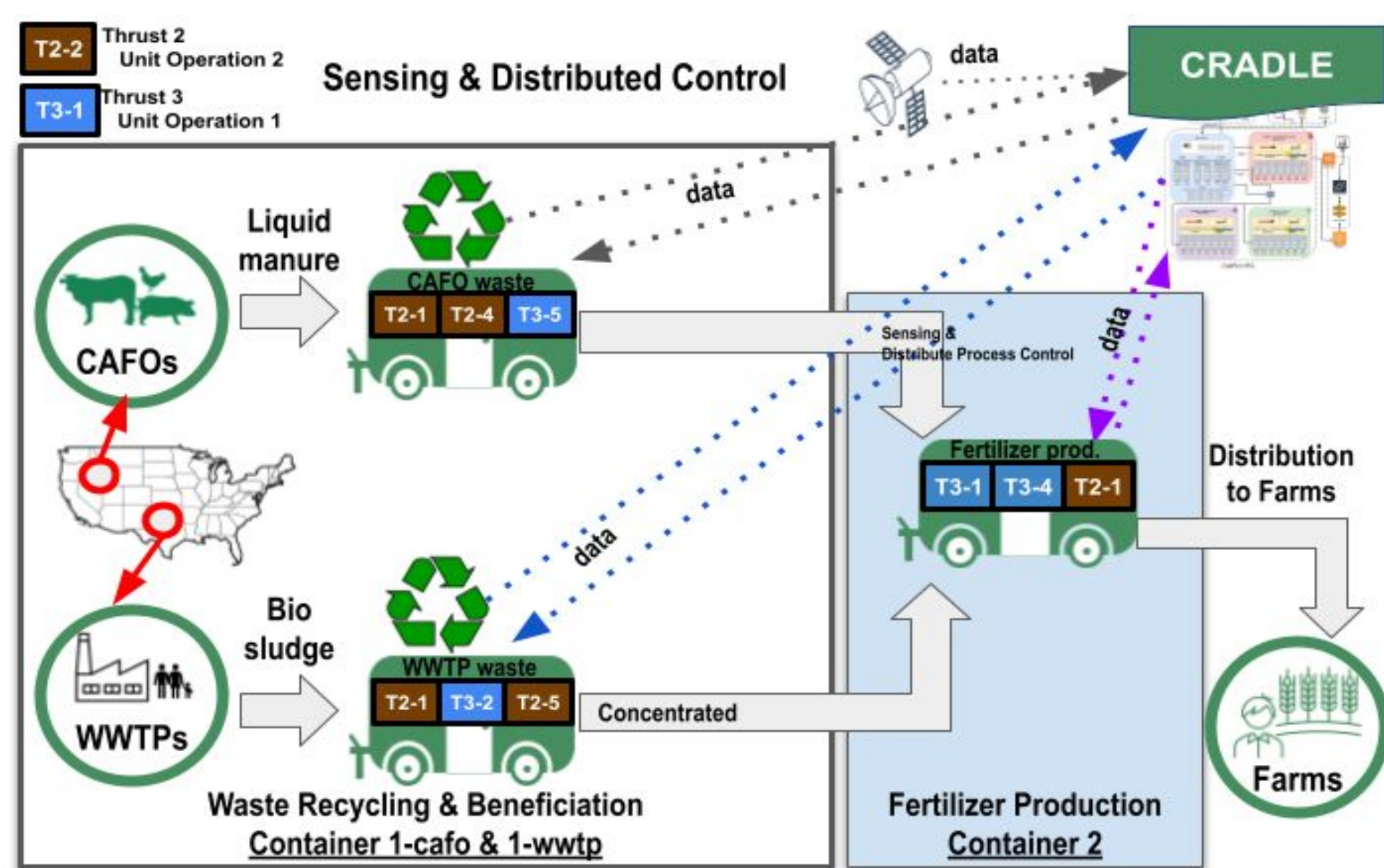
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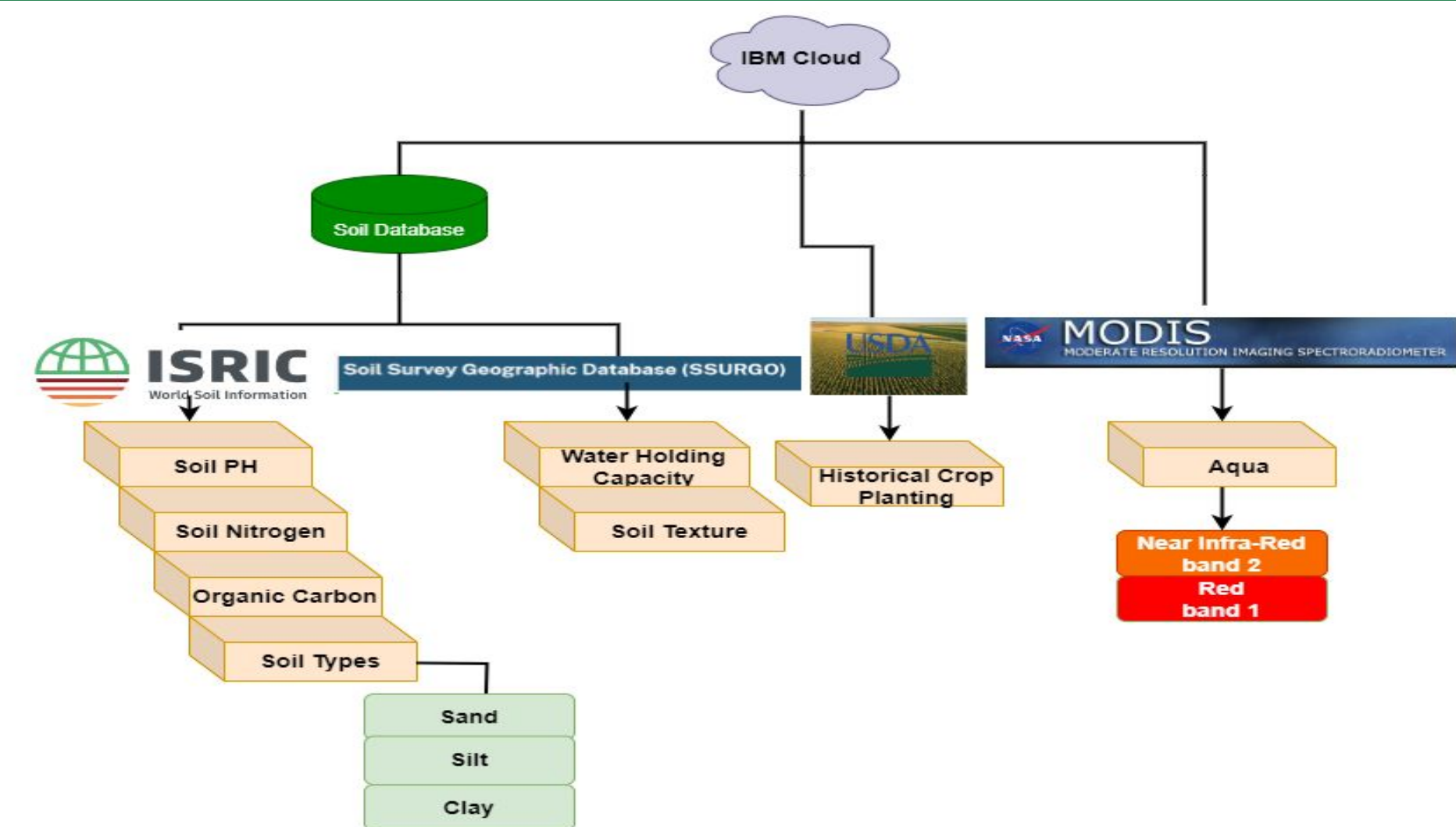


Introduction

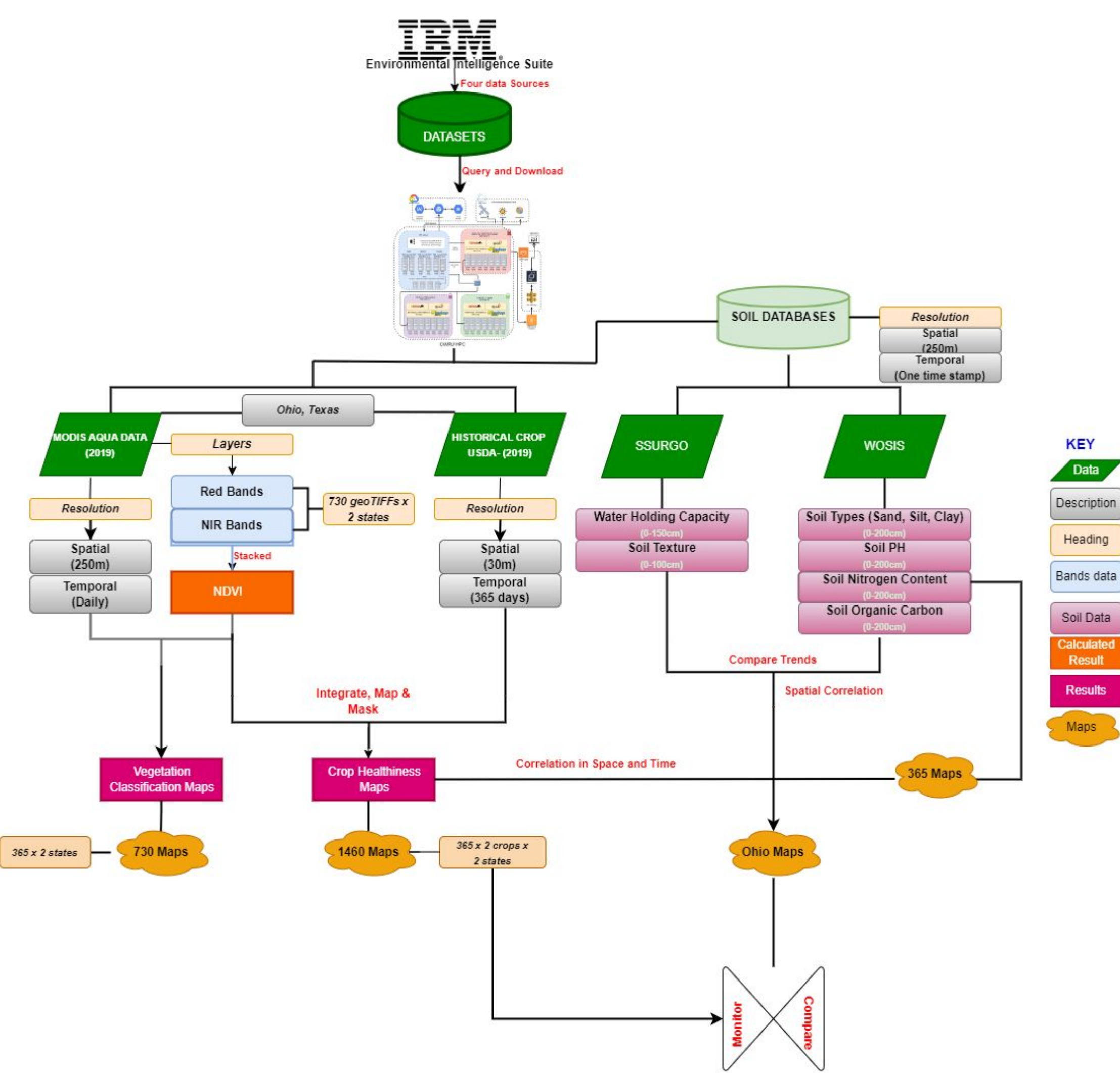


- Aiming to resolve the problem of land application and proper crop planting among farmers
- Mitigate continual runoff from CAFOs/WWTPs into streams.
- Geospatially locate where to position CASFER trailers

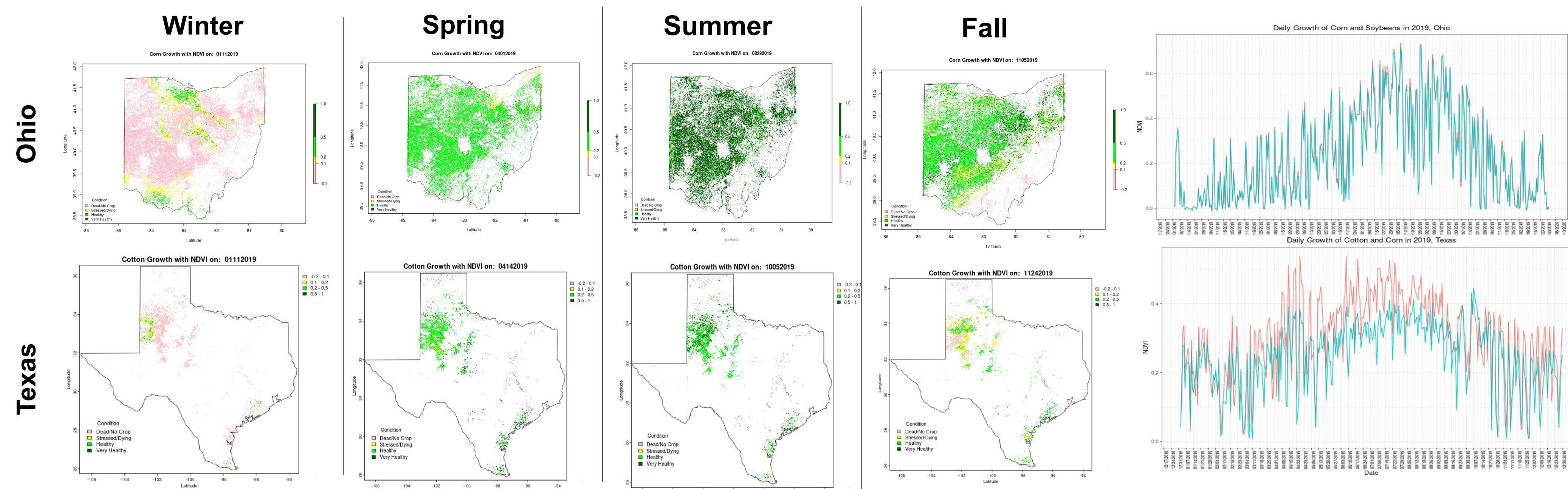
Datasets



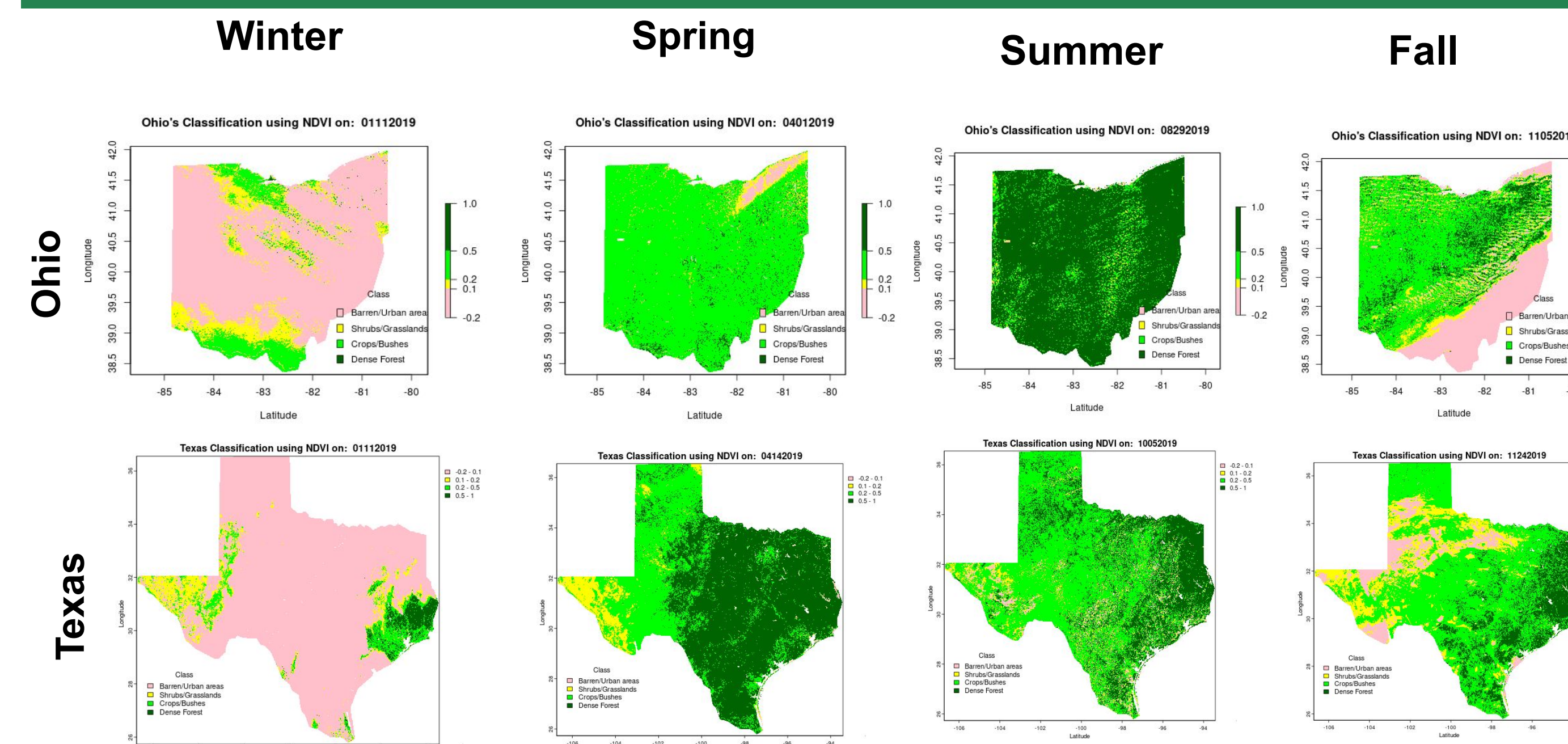
Methodology



Daily Crop Healthiness

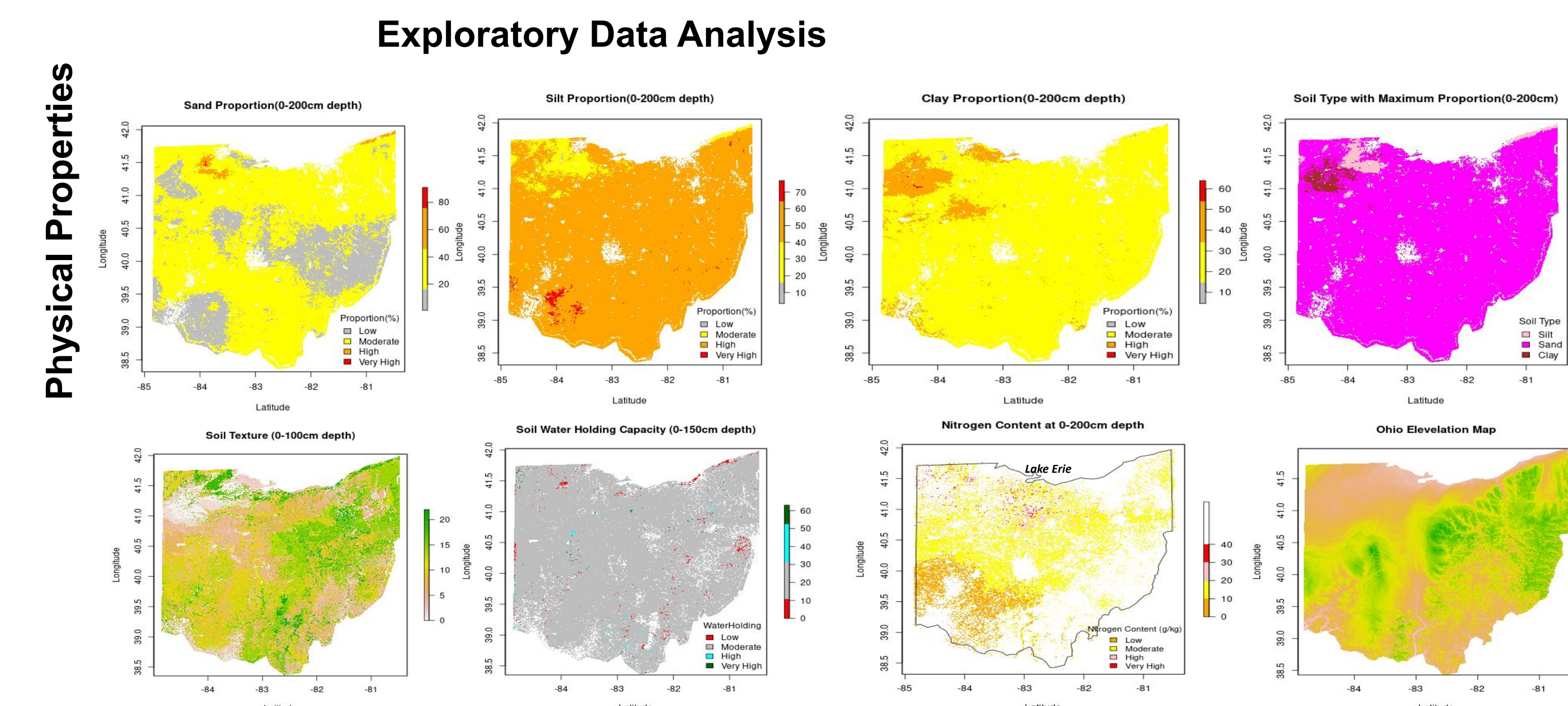
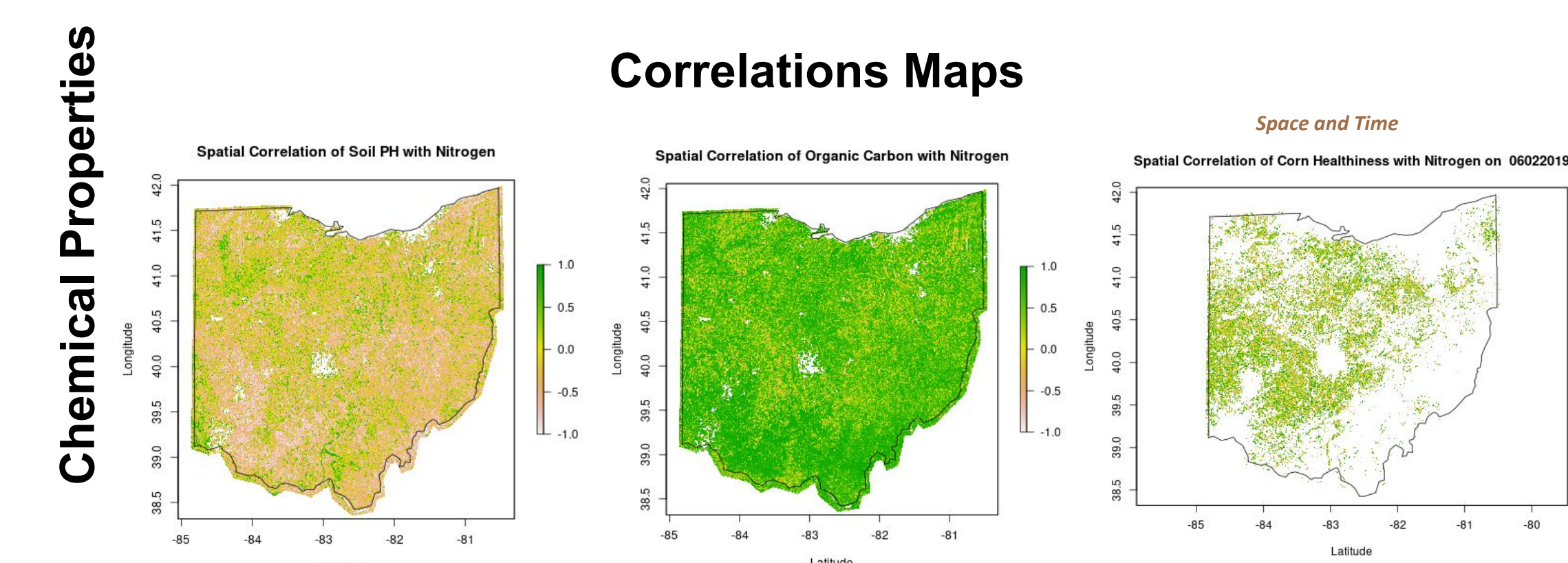


Daily Vegetation Classification



- Vegetation Index**
- MODIS Aqua (red and NIR bands) were used to classify Ohio and Texas
 - Classification is done with the calculated NDVI.
- $$\text{Normalized Difference NDVI} = \frac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$$
- Vegetation Index**
- Ohio: Corn and Soybeans
 - Texas: Cotton and Corn
 - The greenness of the crops vary with seasons, location and crop type.

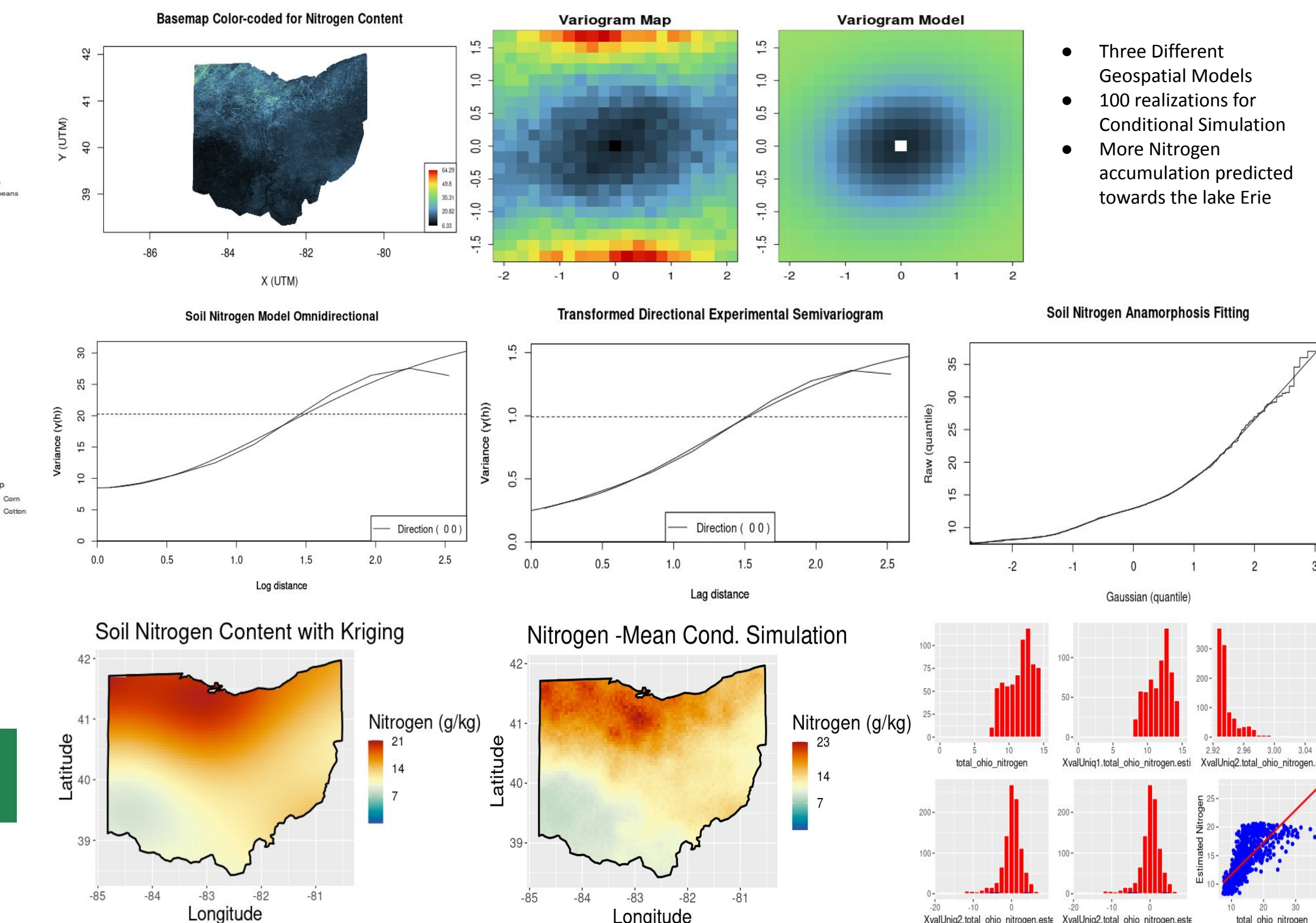
Nutrient Distribution



- Discoveries**
- PH has negative correlation with Organic carbon, Crop Healthiness and Nitrogen
 - Maximum Silt and Clay towards the Maumee Watershed
 - More Nitrogen accumulation towards Lake Erie and Maumee Watersheds

- Nutrients Flow**
- Relatively low texture towards Lake Erie correlates with silt and clay available in that area
 - Moderate Holding of water/nutrient across the state
 - High Nitrogen accumulation in low elevation area

Predictive Model



- Three Different Geospatial Models
- 100 realizations for Conditional Simulation
- More Nitrogen accumulation predicted towards the lake Erie

Takeaways

- Gains
 - Recommendation for farmers on crops planting and getting the locations where crops are planted.
 - Monitoring metrics is needed in land application in pursuit of the nitrogen circular economy
 - More nitrogen accumulation/contamination in known areas (help to know where to position CASFER trailers)
 - Soil Nutrient Distribution:
 - Useful on when land application is appropriate
 - Knowing right crop, best soil and time to plant
 - Soil properties correlate with nutrient flow
- Next
 - Integrate weather, CAFOs, water and elevation data
 - Explore other soil properties

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Thrust Interactions

