Committee Meeting #1

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7/22/2021

Committee Meeting Agenda

- Approve Paperwork
- Update on what I have done so far
- Discussion on Future Work

Project 1: Arctic Sea Ice Feature Detection

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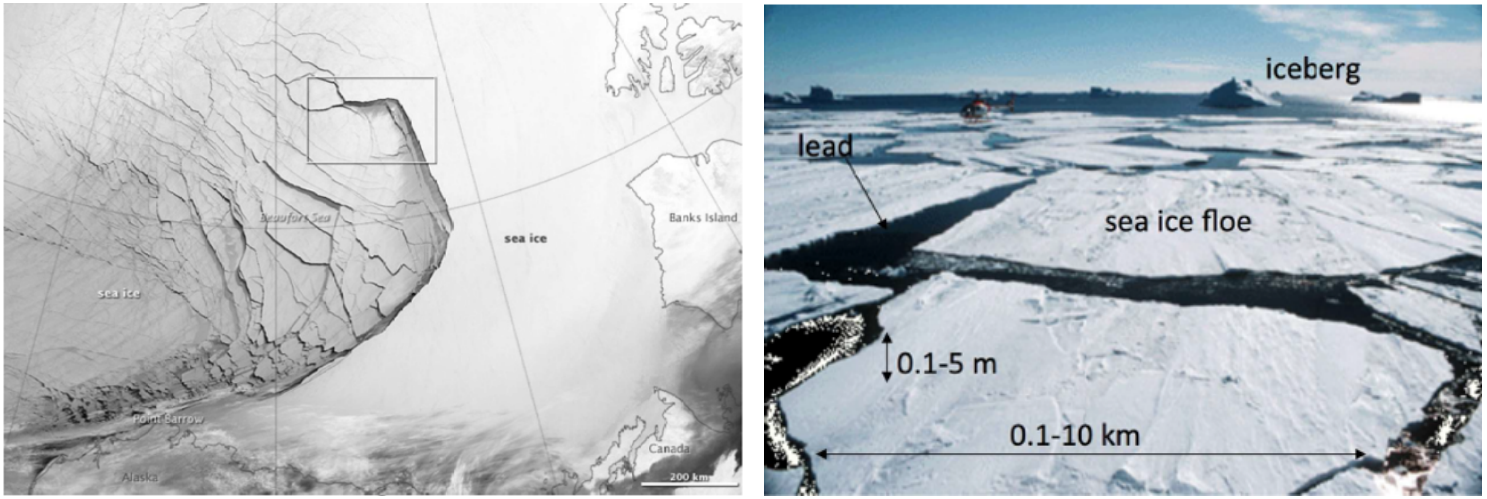

Figure 1: Figures of Ice Cracks

Motivation

- What are We trying to Do?
  - Develop a method to determine where possible Ice Cracks may form
- Data Given
  - Gpid: Identify of part of ice chunk
  - Location of gpids (x/y)
  - Observation Time: Have 22 days worth of data
  - k: image index (sometimes will have multiple observations for a gpid on a day)

Sea Ice Motion Animation

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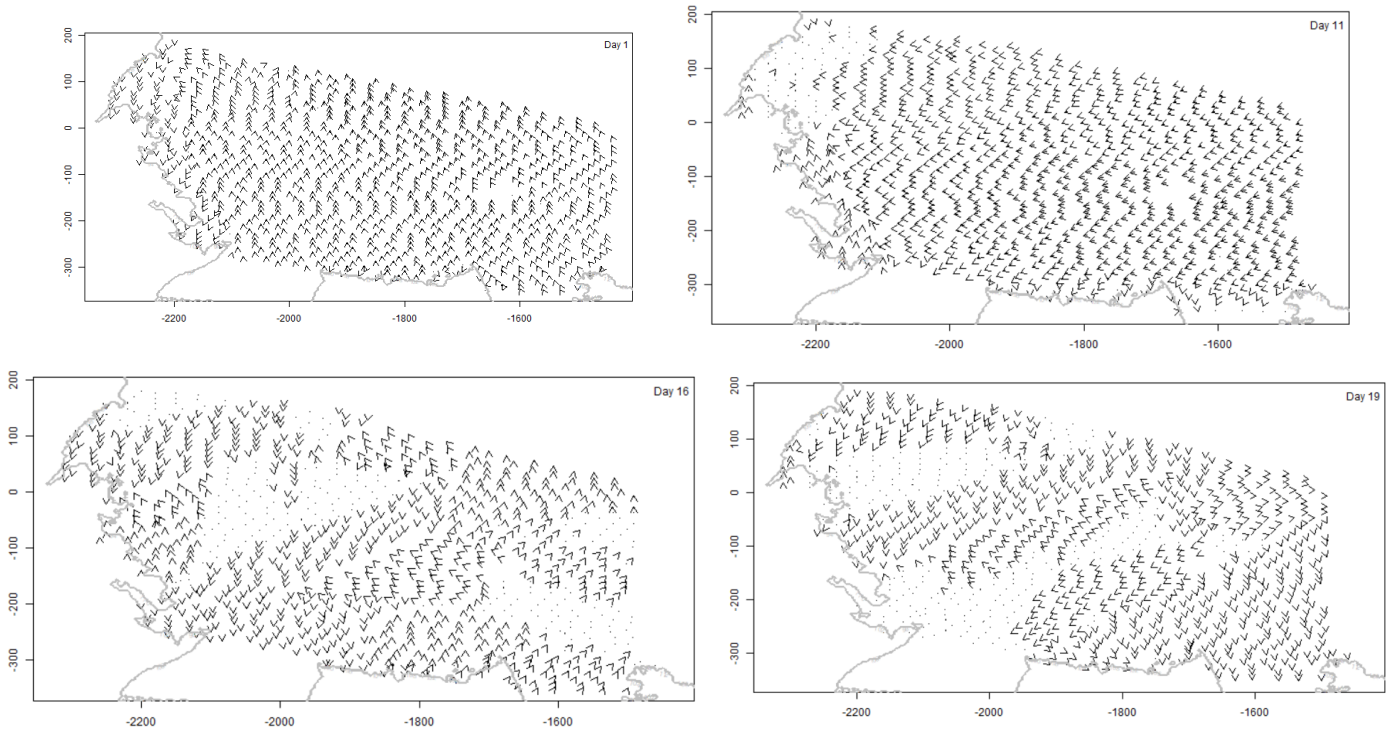

Figure 2: Ice Motion

Explanation of Problem

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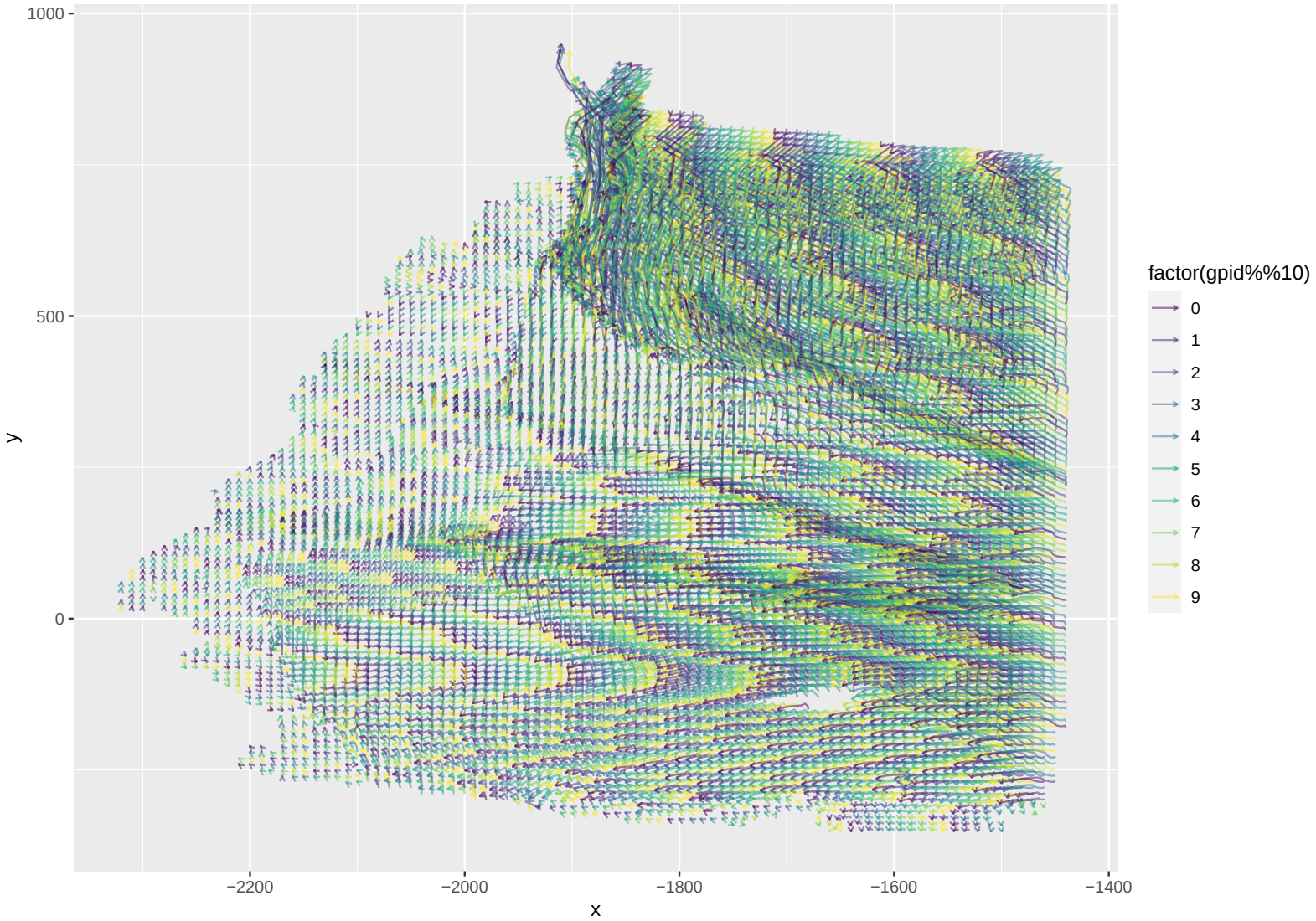

Challenges

- How gpids are laid out (can't use density-based clustering)
- Missing chunks of data
- Only motion data is observed
- Typical interpolation methods aren't suitable
  - Non-smooth spatial process
  - Nonstationarity due to ice moving as patches.

Proposed Method

- Cluster similar trajectories to identify patches of ice
- Create polygon labels in order to get consistent membership over time
- Space-time interpolation within each ice pack where ice movements are similar.

Clustering with Bounding Box

- Included in Bounding Box
  - Min/Max Latitude
  - Min/Max Longitude
  - Length of Latitude
  - Length of Longitude
  - Angle/Direction Moved
- Use the features of the bounding box as inputs into KMeans Clustering
  - The boundaries of each cluster would be where the ice crack forms
  - The number of clusters was determined using the silhouette statistic

Clustering at 1 time point using all available days to Create Bounding Box

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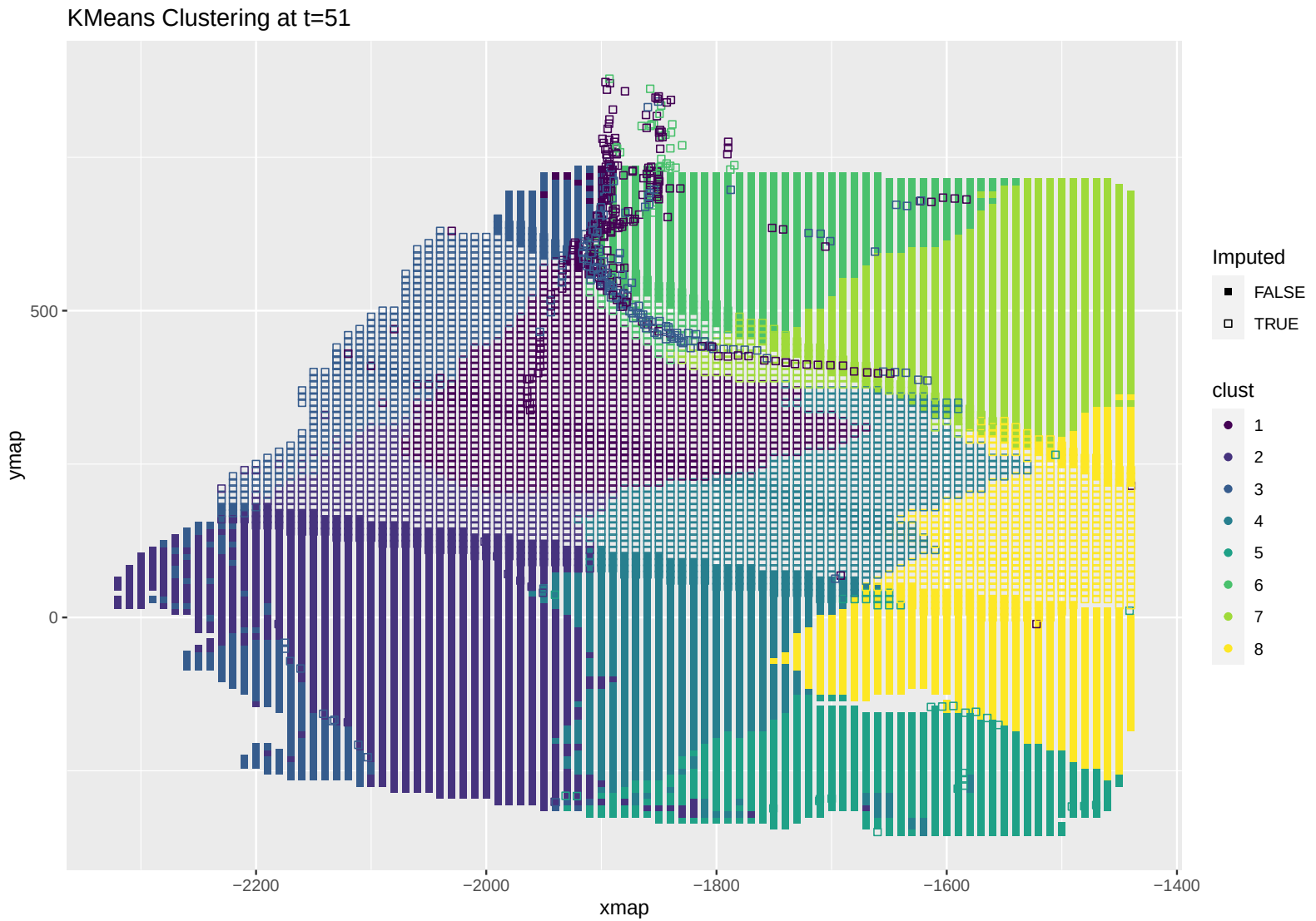

Currently Working on: Interpolation

- Want to be able to interpolate the missing x/y gpid information
  - Challenges:
    - When missing gpid information, missing it in chunks
    - For spatial- temporal interpolation, in order to calculate the distance matrix, need latitude and longitude.
- Our Method: Use of Polygon Intersections
  - Trying to Find Spatial and temporal neighbors and use these to interpolate onto a grid

Interpolation Example

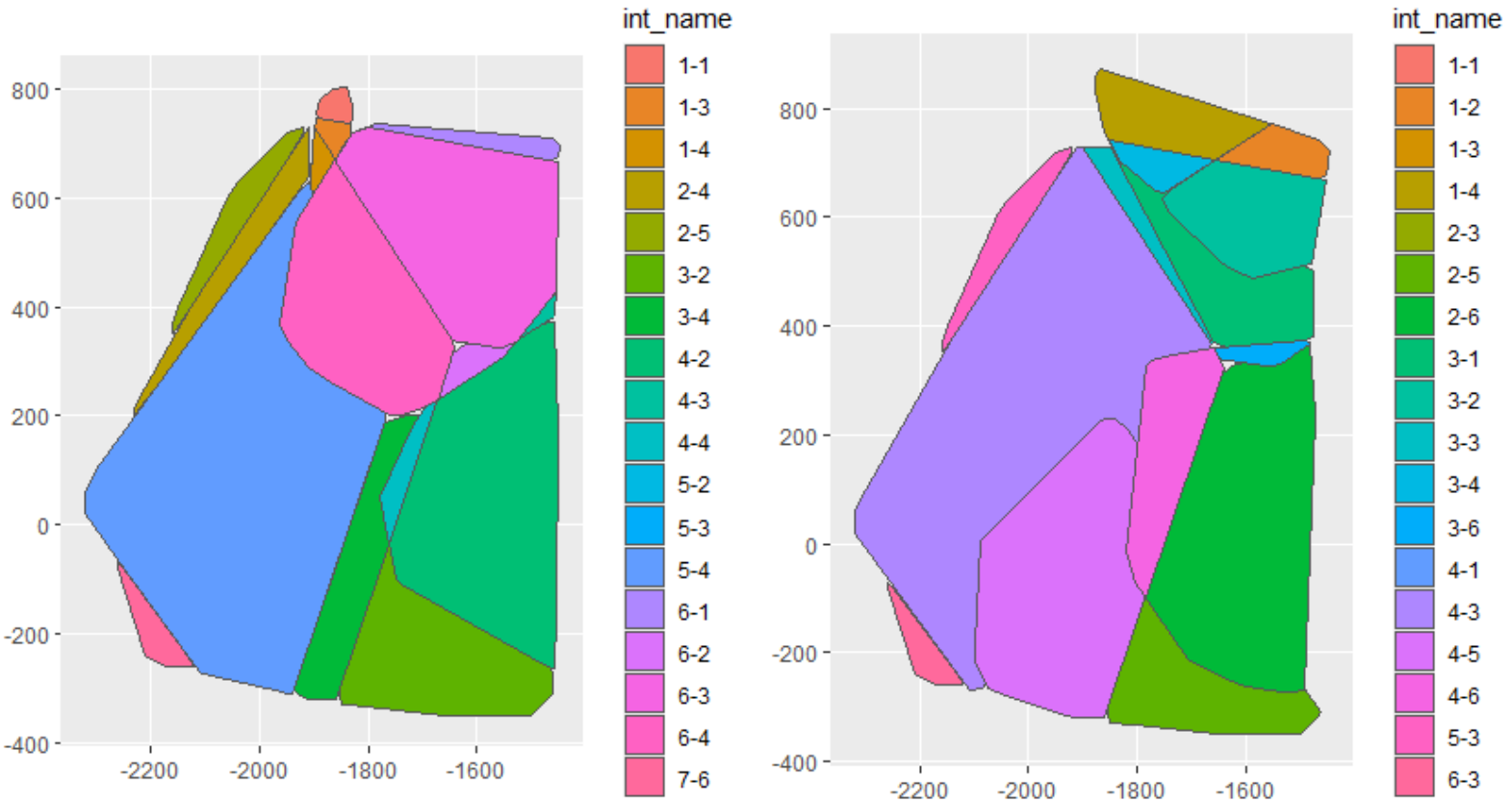

Figure 3: Weekly Intersections of Polygons

Next Steps: Finish Project 1

- Finish Ice Features Project
  - Now that I have found the Spatial-Temporal Neighbors, use these to interpolate the missing gpids (current)
  - Interpolation Comparisons
- Create a pipeline so can become more automated (for example, if have more days)

Next Steps: Project 2

- Next Project: User Interface and Decision Tool for Farmers to Make Trial Decisions.
  - Shiny app of report from Trial Planning
  - Shiny app for analysis