



Seasonality Pro: Visualizing Real-Time Model Data on the iPad

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Gauchó Software

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Seasonality

Mac and iOS apps for weather enthusiasts



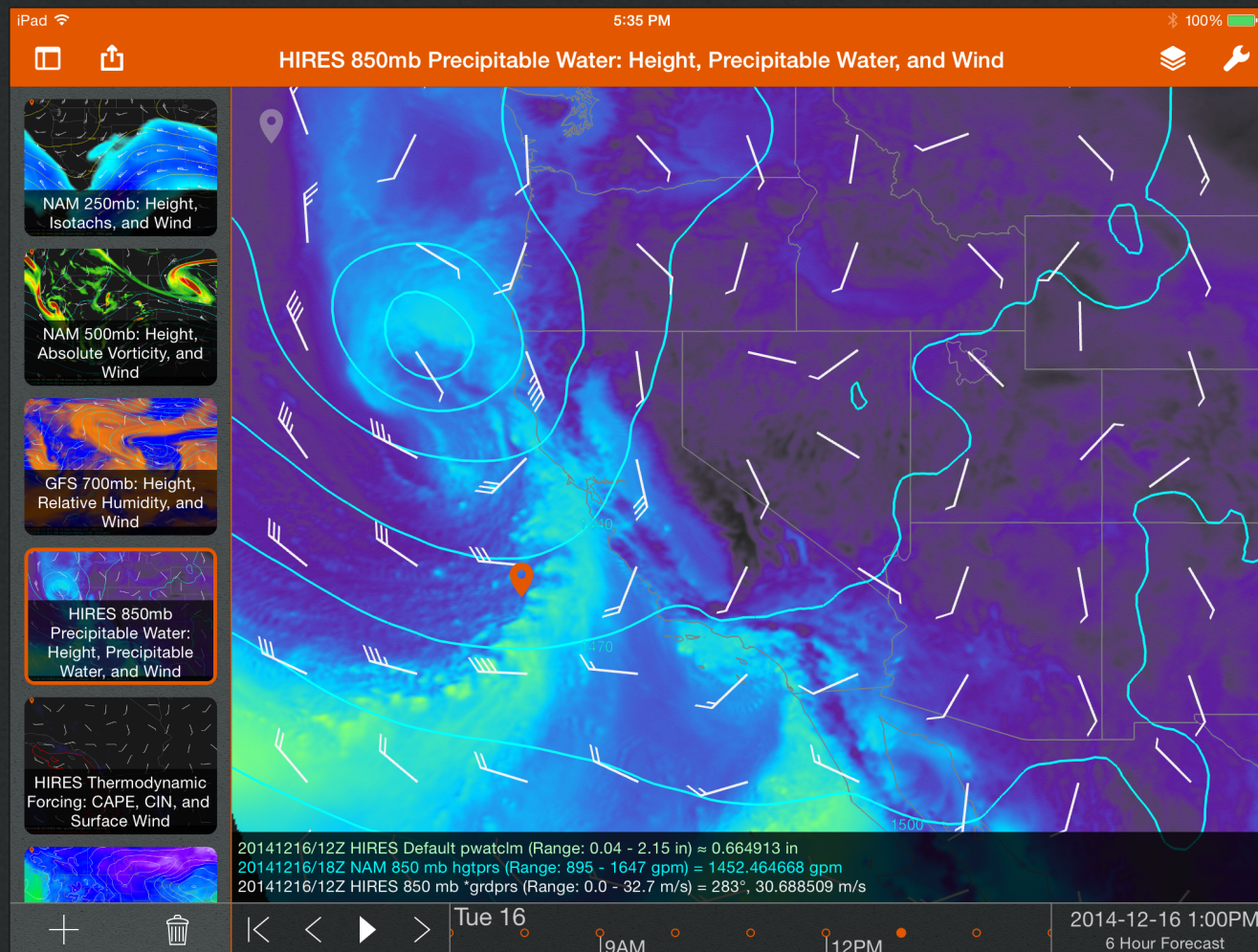
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Goals

- Access a full suite of weather model data from mobile devices quickly and easily
- Create maps with vector-based overlays from the model data
- Enable the user to actively navigate maps without loss of quality
- Save any number of frequently-used maps and easily view them again at any time

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The Data

- Data provided by the NOAA Operational Model Archive and Distribution System (NOMADS)
- Several models offered: GFS, NAM, HIRES (ARW & NMM2 Cores), RAP, HRRR, WAVEWATCH...
- OpenDAP allows clients to quickly query just a slice of data, perfect for mobile devices

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Map Boundaries

- Vector-based
- Developed GSShapefile, an Obj-C Shapefile parser (github.com/mikepj/GSShapefile)
- Several default maps are included
- Will take requests for additional maps

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Overlays

- Several layer types are available for users
 - Contours
 - Blended
 - Composite layers like wind speed from U/V
 - Wind barbs
- Colors, gradients, contour intervals and ranges are all configurable
- Built-in data smoothing

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Drawing

- Entire map quickly rendered in OpenGL ES
- Multiple CPU cores are used if available (GCD)
- Can redraw the map at or near 60 fps
- Easy map navigation: touch/drag to pan and pinch to zoom

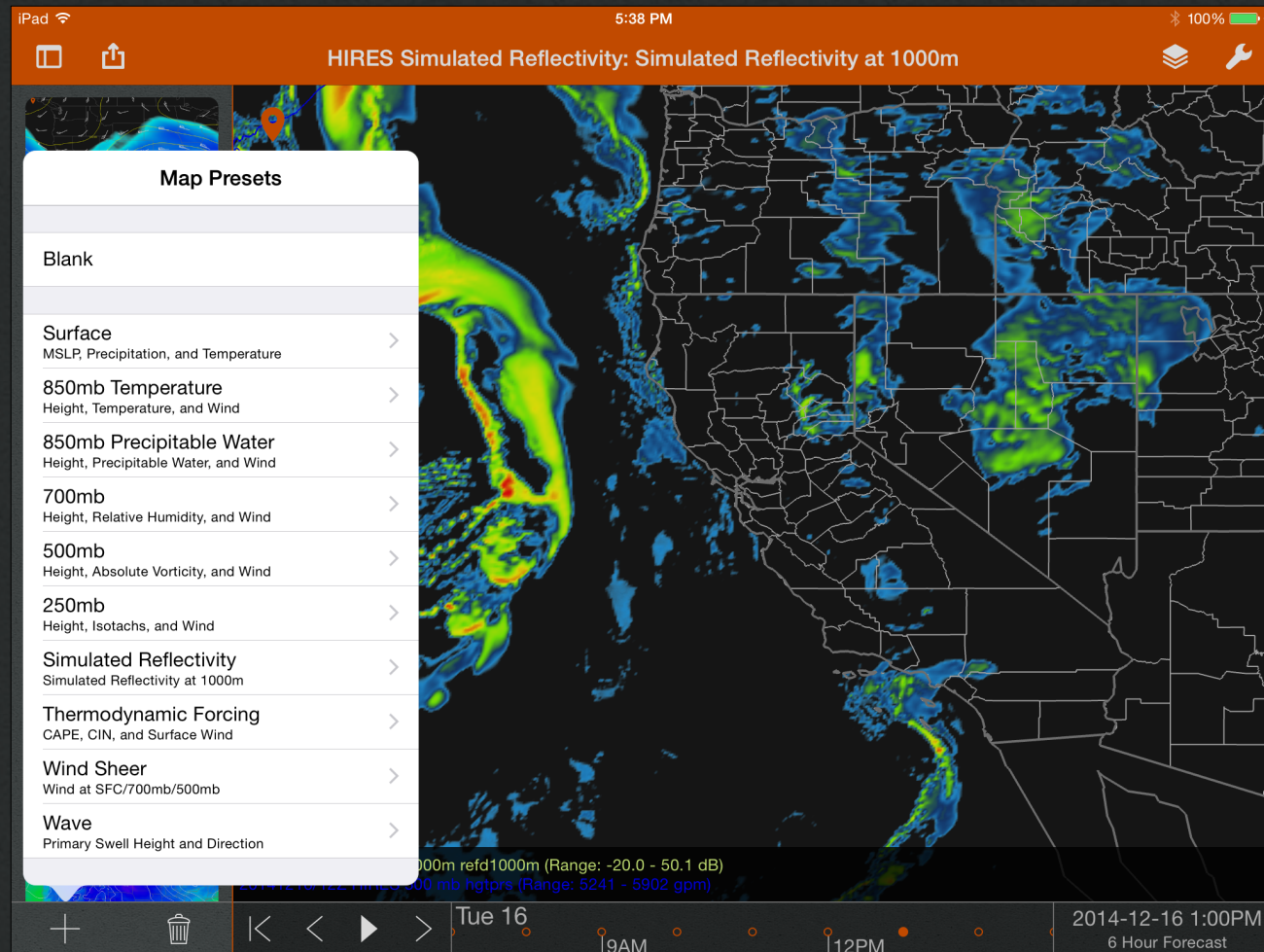
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User Experience

- Seasonality Pro does the work for you
 - Map templates let you get started quickly
 - Model variables are categorized to make them convenient to find
 - When adding a new layer, Seasonality Pro will look at the model variable/level and select reasonable defaults to minimize setup time
- Layers are easy to customize

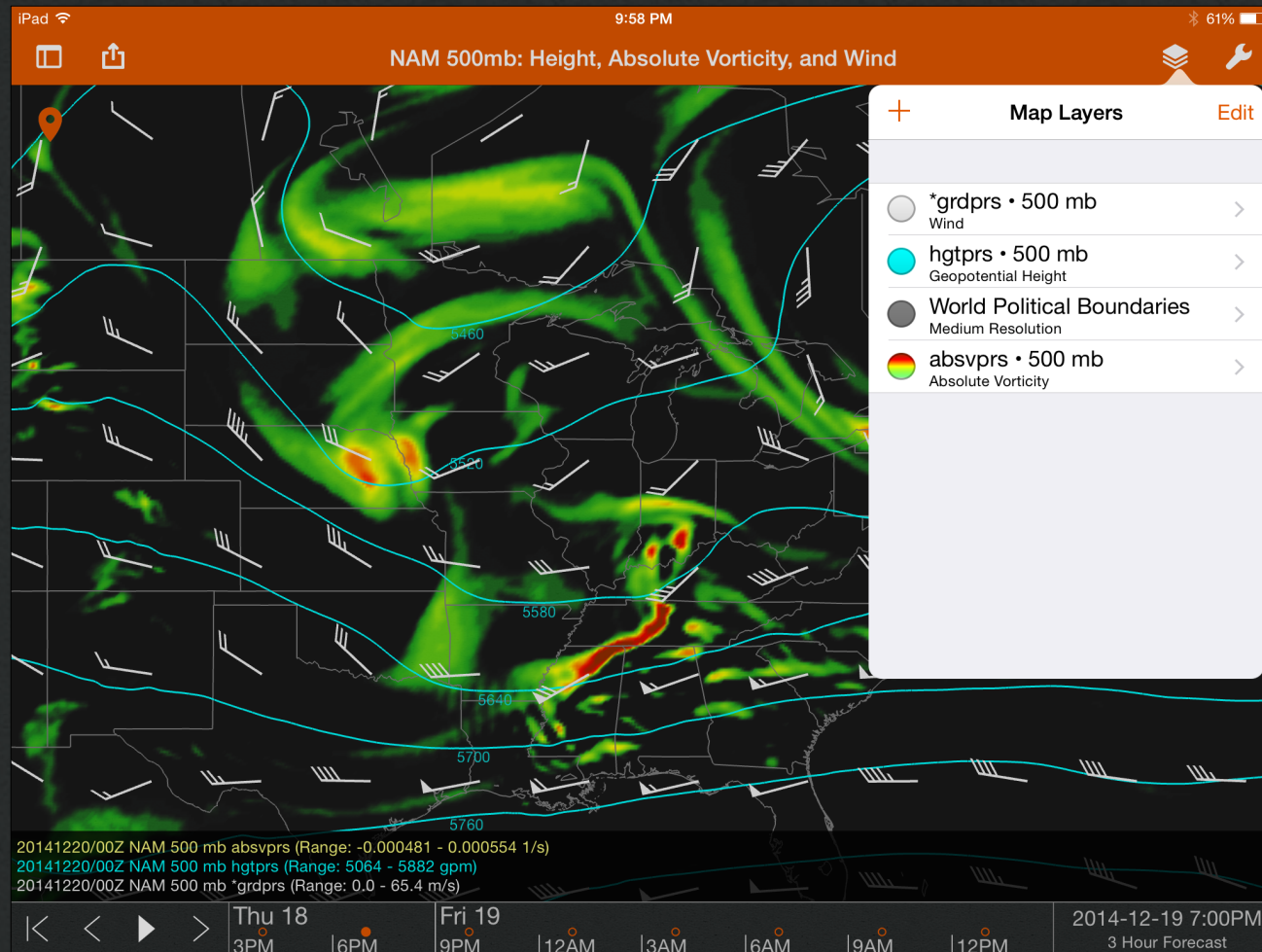
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Map Presets



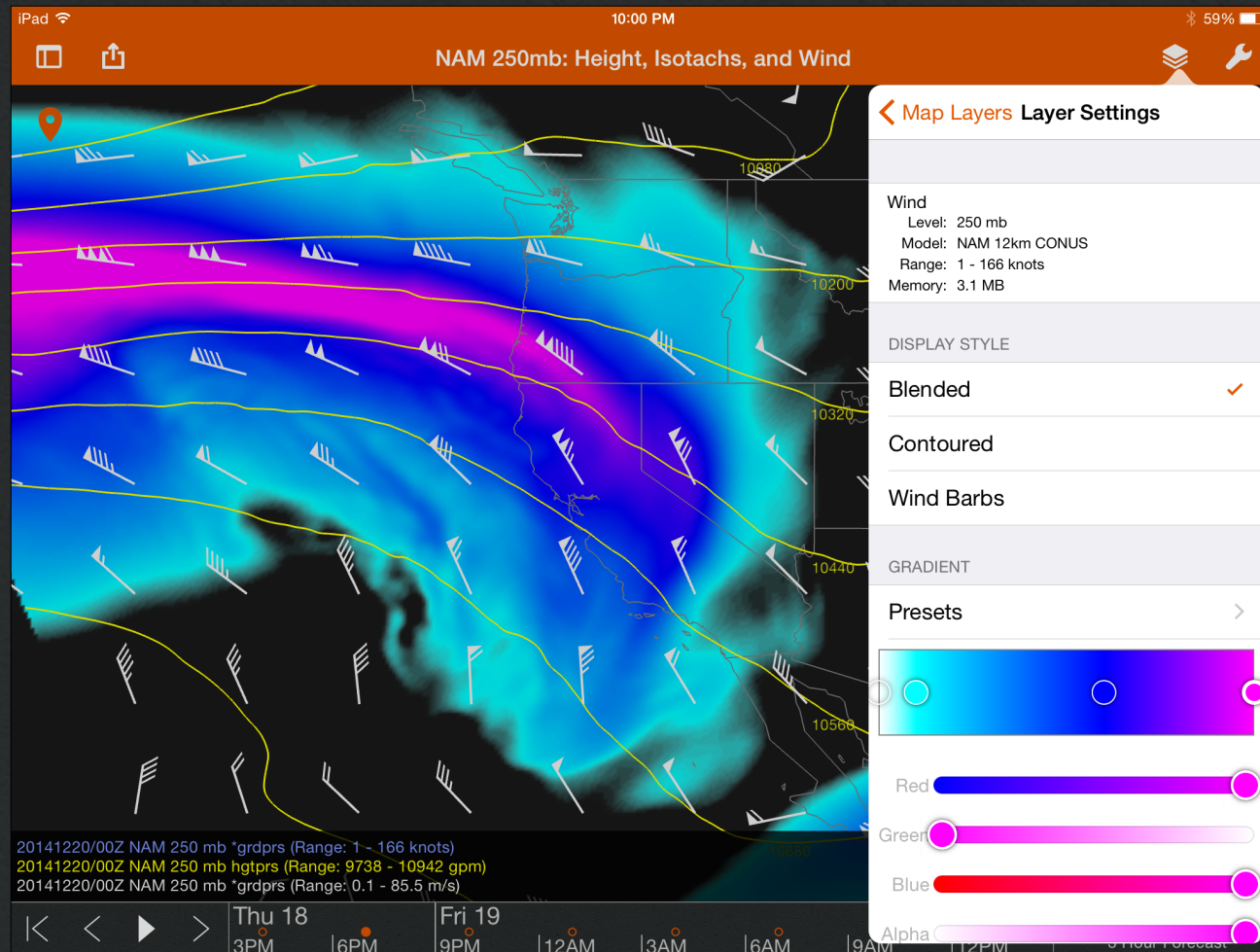
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Managing Layers



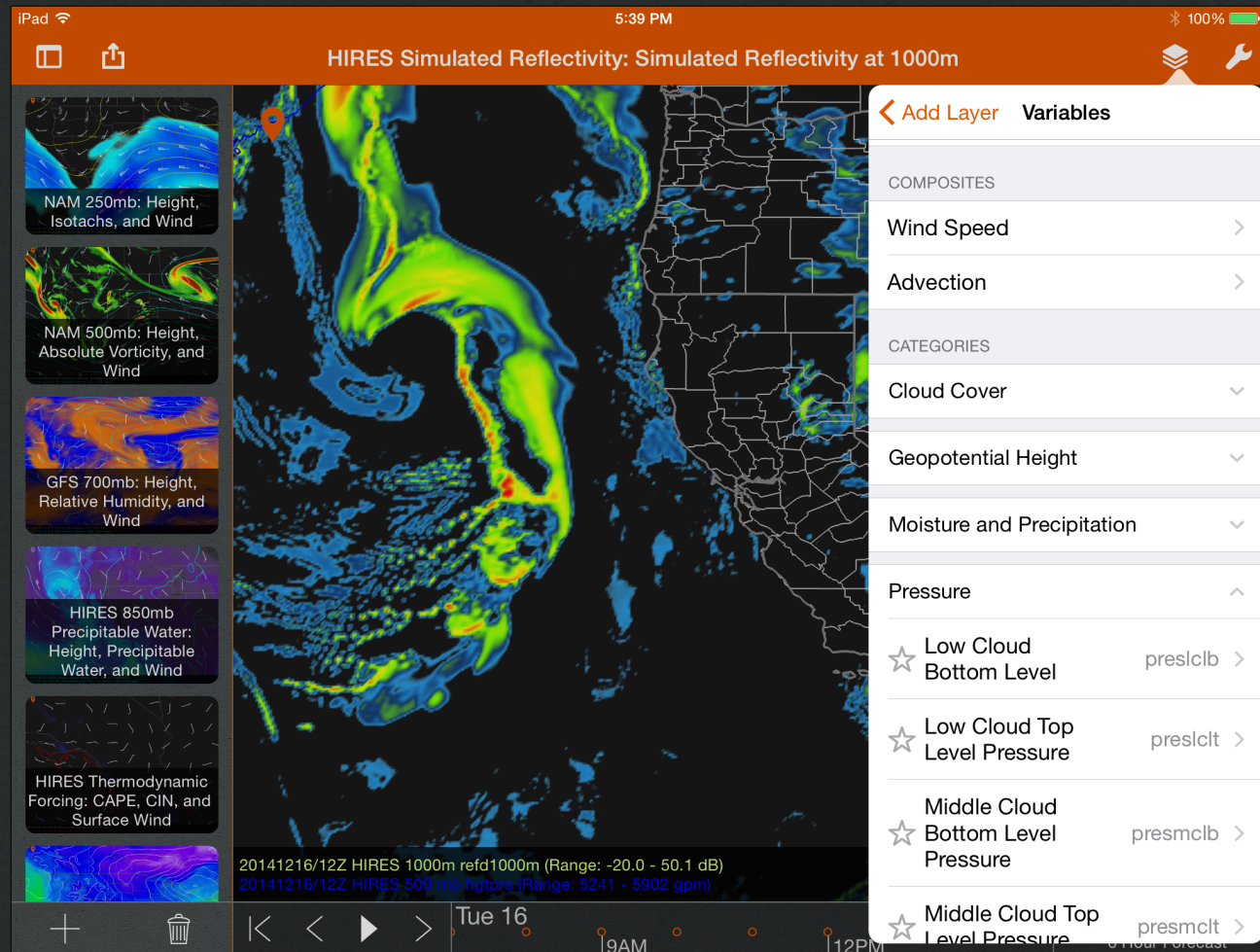
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Layer Settings



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Adding Layers



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Graphics Optimizations

- OpenGL: Use VBOs and VAOs when possible
- Mobile devices have limited memory, and increasingly fast processors
 - Sometimes it's faster to generate and draw just the vertex data currently visible instead of storing an entire model layer on the GPU
 - Shared memory between the CPU and GPU helps

Memory Optimizations

- Using smaller variable types
 - Colors are 4 GLbytes, not 4 GLfloats
 - Data from OpenDAP is returned as a grid of 32-bit floats, so avoid using potential 64-bit types like CGFloat to store it

Memory Optimizations

- Using smaller variable types
 - For blended gradient layers, often a 256 color palette will suffice, so the float grid is converted to a scaled byte (int8_t) grid as soon as possible to use less memory
 - Similar optimizations in other layer types, paying particular attention to memory amounts used in large arrays of a variable type

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Optimizations

- OpenDAP grids are cached on disk
 - Local storage is flash-based, so relatively fast to load into memory again if needed
 - Grids are only downloaded once, key on mobile where devices often have bandwidth limits

Availability

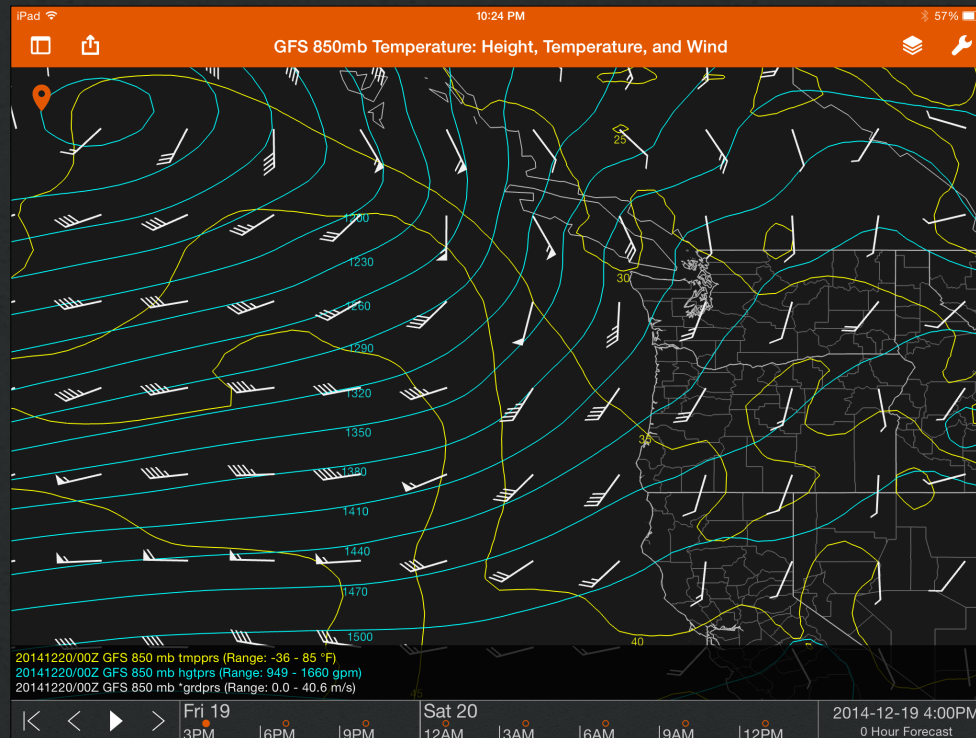
- Almost ready to beta test
- Hoping for a final release in 1-2 months
- If interested in beta testing, send me an email
- Requires iOS 8
 - iPad 2, iPad mini, or later
 - iPhone 4S or later

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Thank you!

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