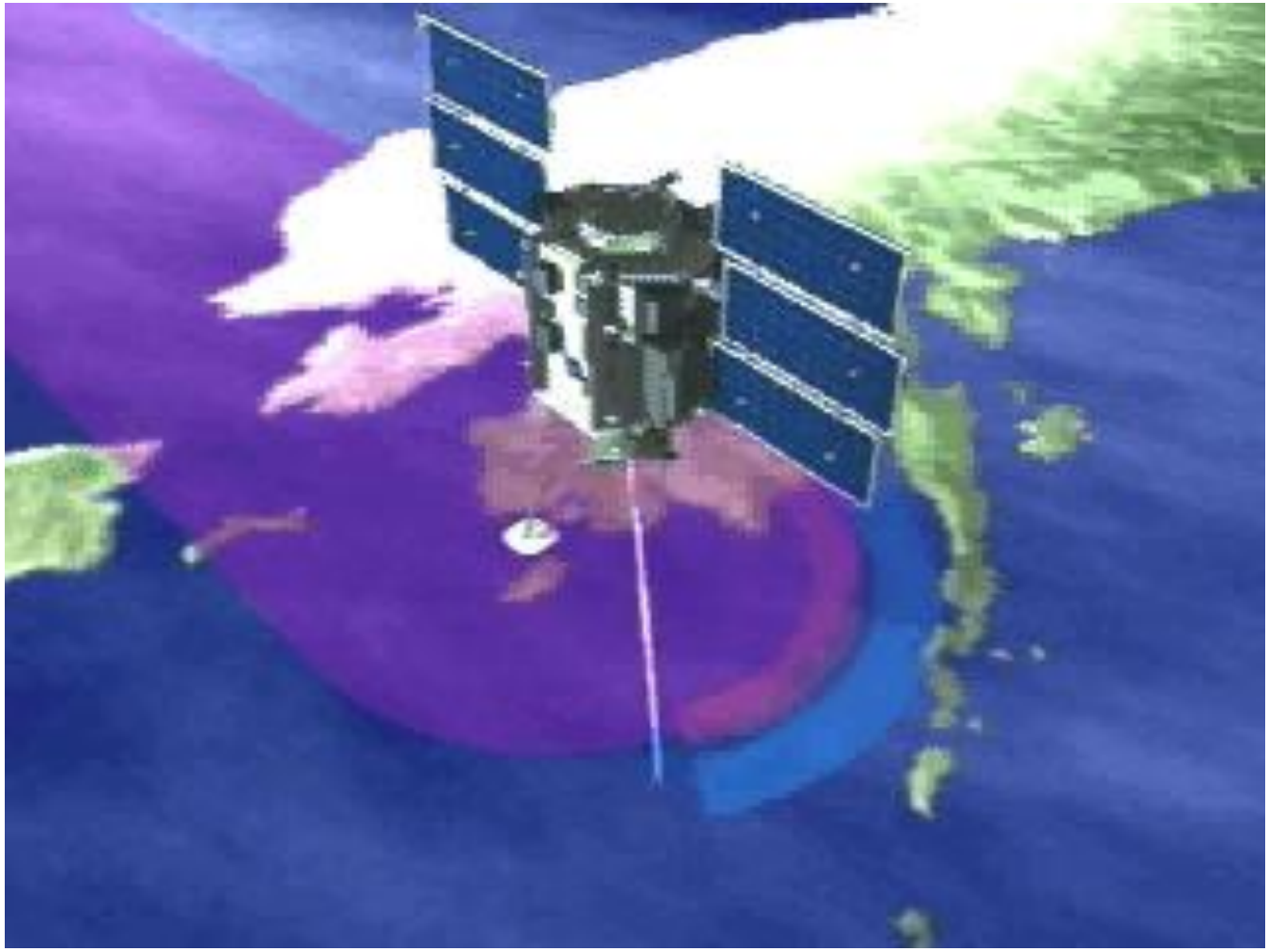
Update on the Winds and Currents Mission (WaCM)

Mark Bourassa (Florida State University), Ernesto Rodriguez, Dudley Chelton, Tom Farrar, David Long, Thomas Kilpatrick, Nikolai Maxeminko, Roger Samuelson, Frank Wentz, and Shang-Ping Xie

Instrument Combination

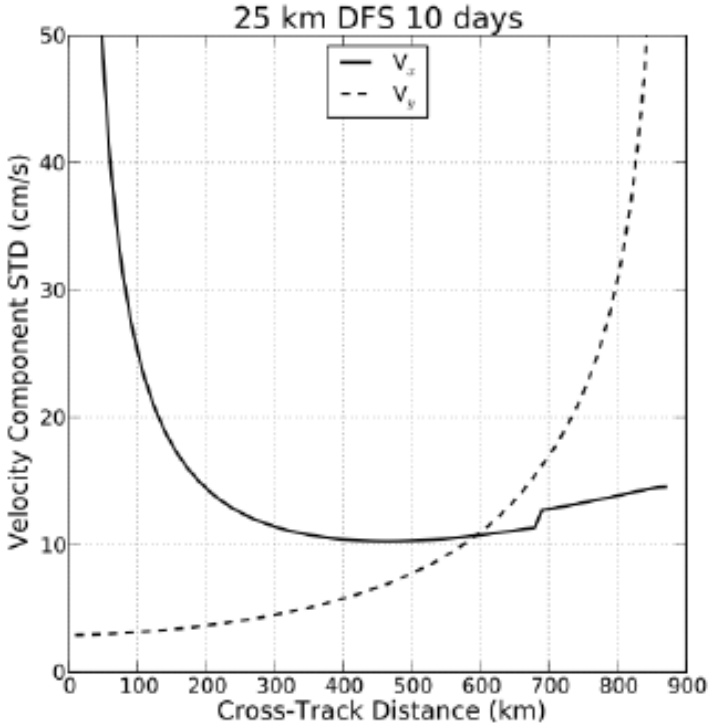
- An AMSR class radiometer with additional high frequency channels for cloud ice (AMSR3; provided by JAXA)
- Pencil beam scatterometers
  - Ku-band (10km nominal resolution; provided by ISRO)
  - Doppler Ka-band (5km nominal resolution for winds; JPL)
    - Ocean current measurements
      - Spatial resolution: <25 km
      - Temporal resolution: <10 days
      - Vector velocity accuracy: 5 cm/s – 10 cm/s
- Key innovations:
  - High resolution winds for coastal applications and calculation of smaller scale (3x scatterometer spacing) divergence and curl
  - Surface currents (from the Doppler scatterometer)
- Many science application benefit by co-flying active/passive combination

Example Scanning Geometry (QuikSCAT)



- Animation from David Long.
- Four flavors of look angles over most of the swath.

Wind-Averaged Velocity Component Errors at Ku-Band



Ka-band has improved sensitivity by a factor of 2.7

To avoid lack of sensitivity at low wind speeds, restrict surface current (but not wind) retrievals for winds above 5 m/s.

Account for this in the number of samples in 10 days by assuming a Rayleigh distribution for the winds.

Graphic from Ernesto Rodriguez

Mission Goals

- The nature of the Earth Ventures review process forces proposals to have very
  - Clear science goals
    - Only one or two main goals
  - Clear demonstration that the goals can be achieved
  - Little risk regarding the instrumentation
- Intercalibration with the existing Ocean Vector Wind constellation
  - Ku-band instrument very useful
- Measurement of global ocean surface currents
- Ocean science goal related to Ekman+ pumping that Dudley will talk about next
  - Requires observations of currents and ‘U10EN or stress’
  - Benefits from fine resolution

Reminder

- JAXA, ISRO, and JPL have signed a letter of cooperation to jointly study the feasibility of a joint microwave radiometer/scatterometer mission
- Preliminary discussions have resulted in a nominal configuration including AMSR3, Ku scatterometer, Ka Doppler scatterometer
- A joint team developed a draft science and operations requirement document that will be available for community inputs
- If accepted by the agencies, the nominal launch date would be around 2020

Updates

- The partnership continues
- The barrier of US regulations regarding technology transfer have been removed due to changes in US laws
  - This is a huge benefit for moving forward in a timely fashion
- Our goal of an Earth Ventures Instrument proposal was crushed when a careful budget analysis indicated the instrument alone would put the mission over the $90M budget cap.
- Consequently, we are now aiming for an Earth Ventures Mission
  - $150M budget cap
  - However, we need to provide a launch vehicle and satellite
  - Hence the critical need of ISRO and JAXA partners
  - Proposal due as early as November, 2015

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Science Goals

- GCOM-W2 was originally conceived of for examination of the water cycle
- We have goals related to
  - Water cycle
  - Energy budgets
  - Ocean forcing
  - Wind and SST coupling
  - Cloud and surface coupling
  - Continuity of climate data records
  - Ice motion
  - And a few others
  - A science and operational requirements document is available for those interested (email mbourassa@fsu.edu)