The SEAMONSTER Sensor Web: Lessons and Opportunities after One Year

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Outline

- What is SEAMONSTER?
- What are the goals of SEAMONSTER?
- How to encourage/facilitate collaboration
- Lessons Learned

SEAMONSTER

SouthEast Alaska MOnitoring Network for Science Technology Education and Research

Tlingit carving of Gunakadeit, the seamonster, in downtown Juneau.

A modern seamonster tentacle.

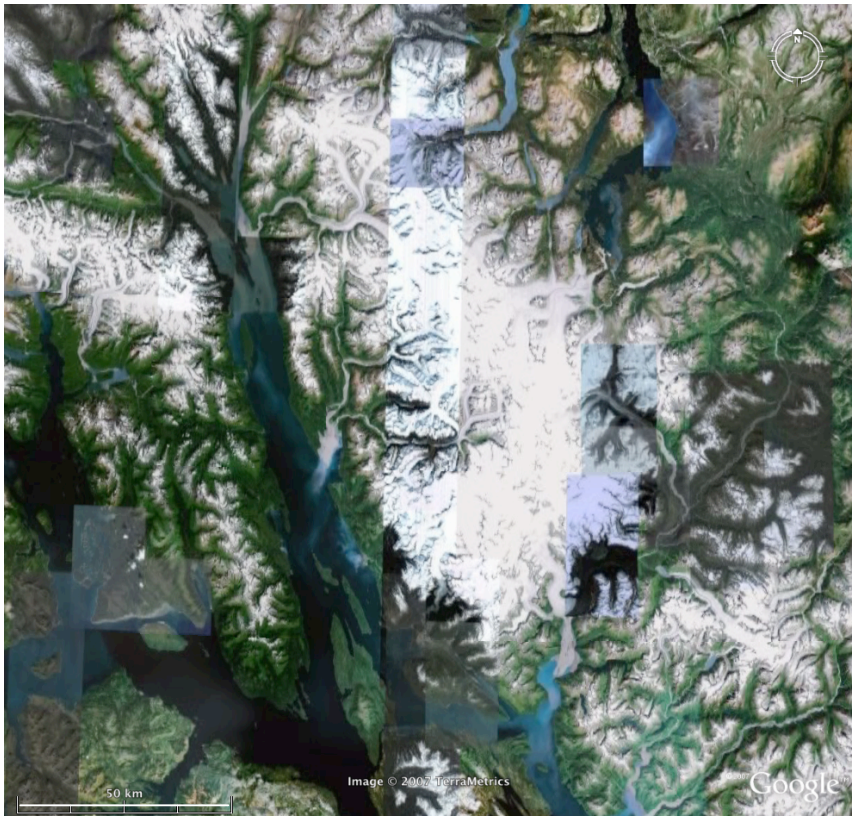
We seek inspiration from a Tlingit legend of a seamonster who brought fish and furs to an impoverished village. We see the modern parallel of harvesting and distributing geospatial information via a sensor web to a world struggling with climate change.

SEAMONSTER

- Scientifically Motivated Technology Development funded by NASA ESTO (AIST)
- Testbed Sensor Web
  > Technology Collaborations
- Path for Technology Infusion
  > Scientific Collaborations

Scientific Motivation, 1

Long term monitoring of the Juneau Icefield to observe watershed and ocean ecological impacts of glacial recession



50 km

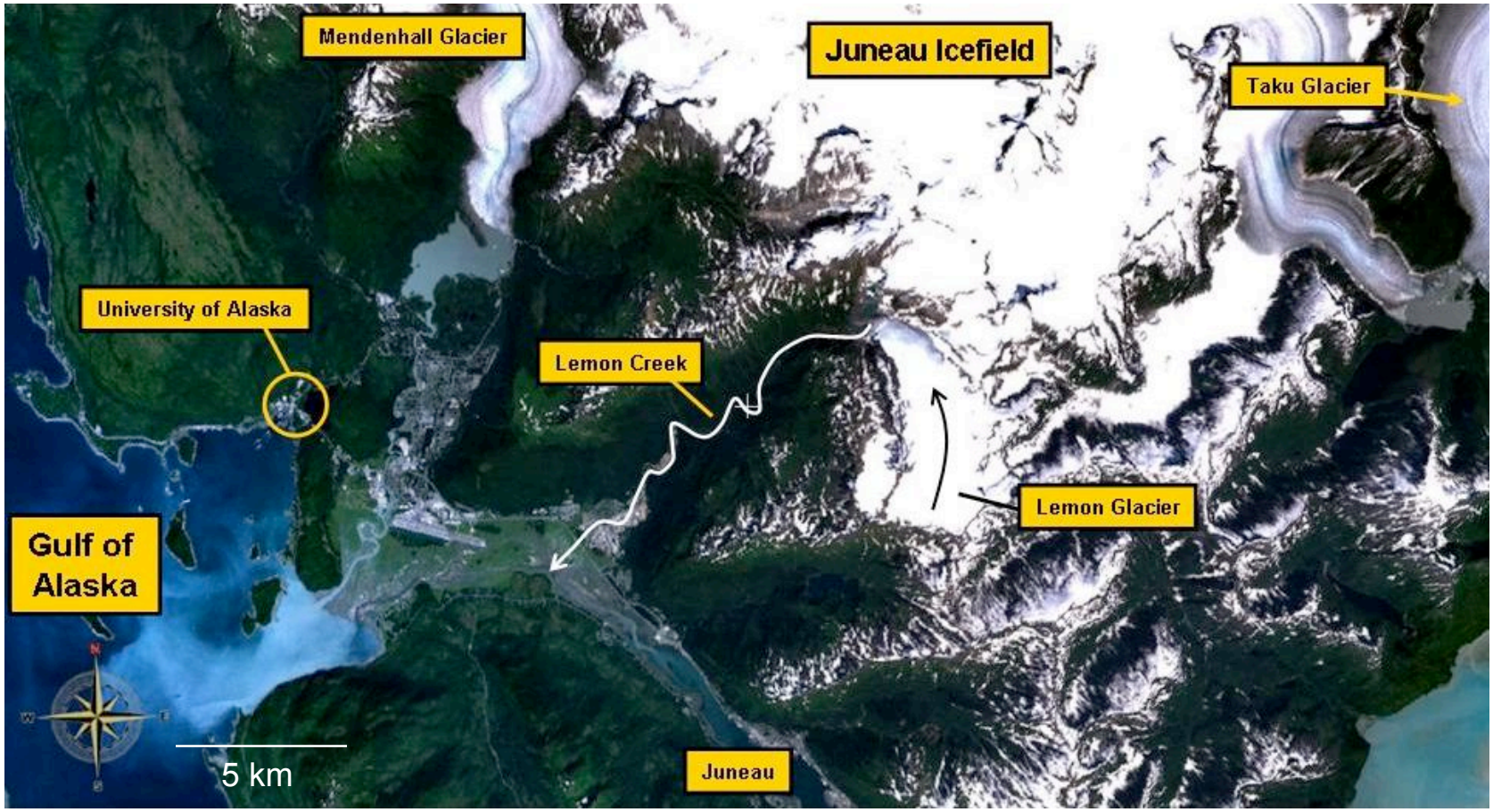
Scientific Motivation, 2

Detection of transient glacial lake outburst floods and observation for watershed impacts

Lake pre-drainage

Lake post-drainage

Lemon Creek Watershed



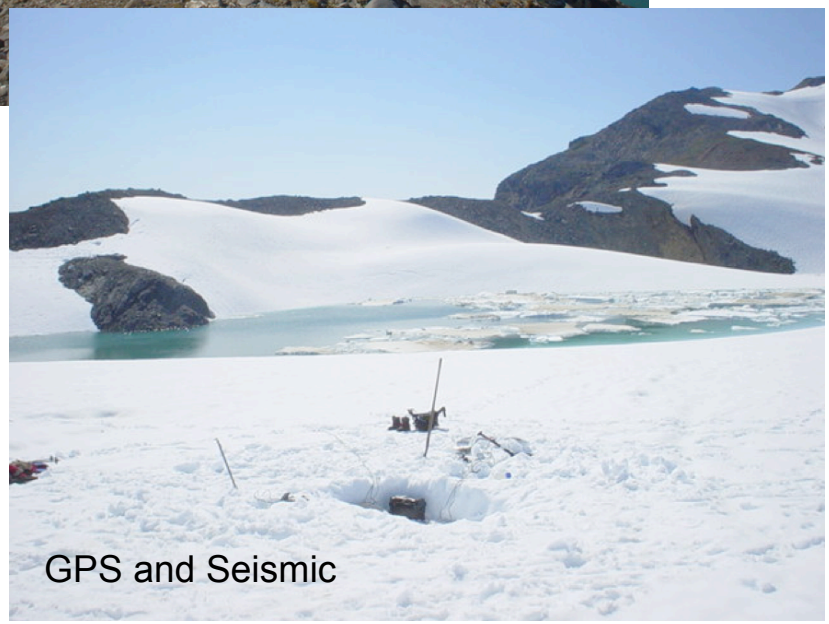
The University of Alaska Southeast has (relatively) easy access to these areas. The initial watershed of interest is the Lemon Creek watershed (fed by Lemon Glacier) which can be entirely accessed via hiking. Lemon Glacier was monitored as part of IGY (1957-58) and is again being studied for IPY (2007-8).

Project Challenges

- Resource management
  - Power constrained (batteries and solar)
  - Also: storage, bandwidth
- Different sampling requirements
  - Long term monitoring
  - Transient, rapidly evolving events

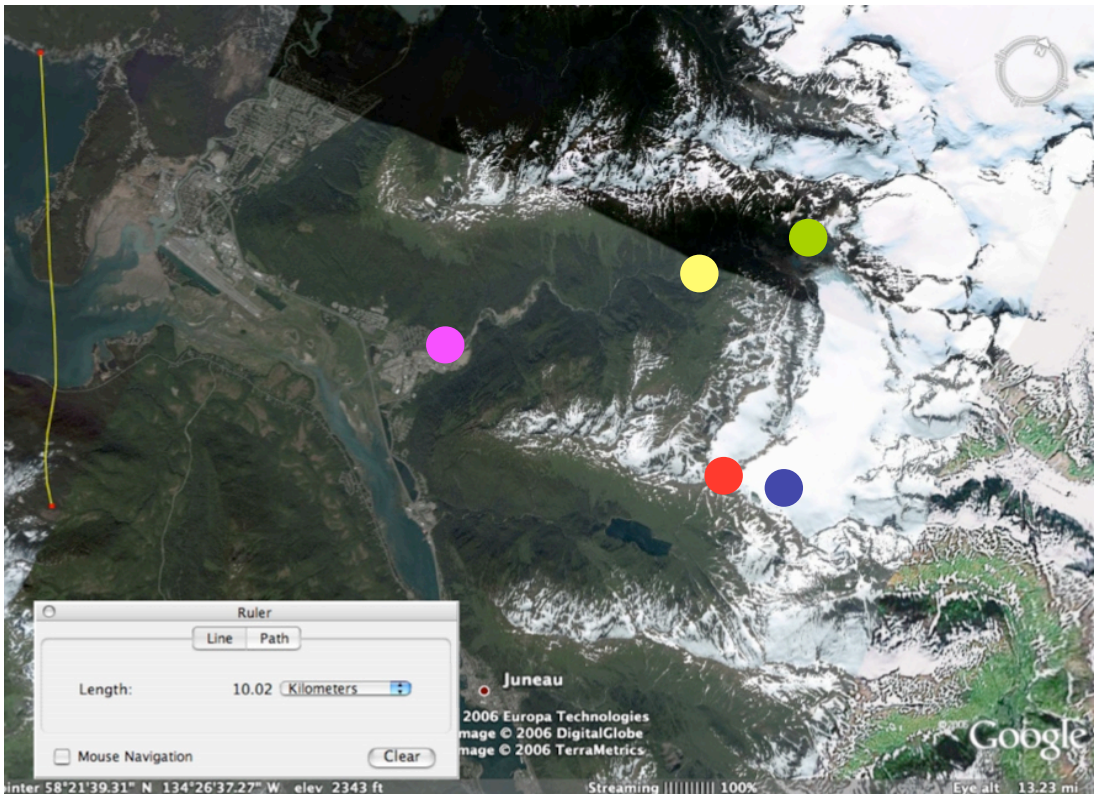
➢**NEED SEMI-AUTONOMY or AGENTS**

Lemon Glacier Instrumentation



User controllable camera

Lemon Creek Sensor Web



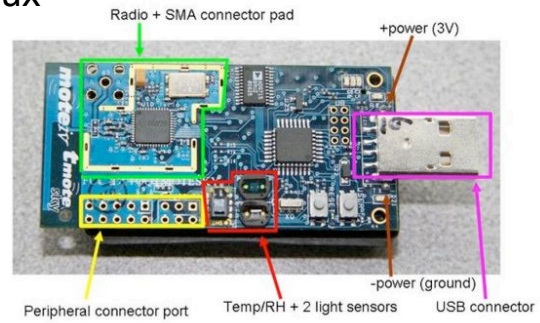
- Met Station, Web Cam, Comm Hub
- Lake Level, GPS, Geophone
- Met Station, Web Cam
- Water Qual, USGS Gauge
- Water Qual

Communication between the nodes enables the Sensor Web. Ex: pressure transducer (●) detects lake drainage and passes the message reconfiguring other sensor behavior.

Platforms

Vexcel provided GeoBrick, Linux

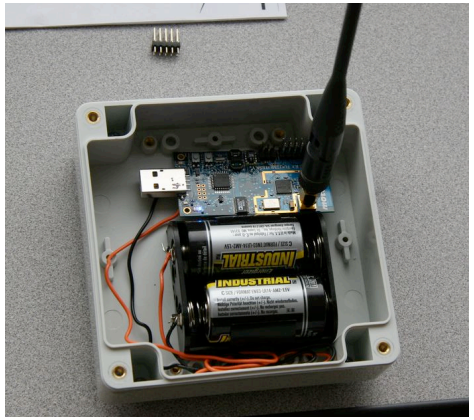
There are three different platforms in use, with relative computation, storage, and sensing capabilities as well as power requirements and cost.



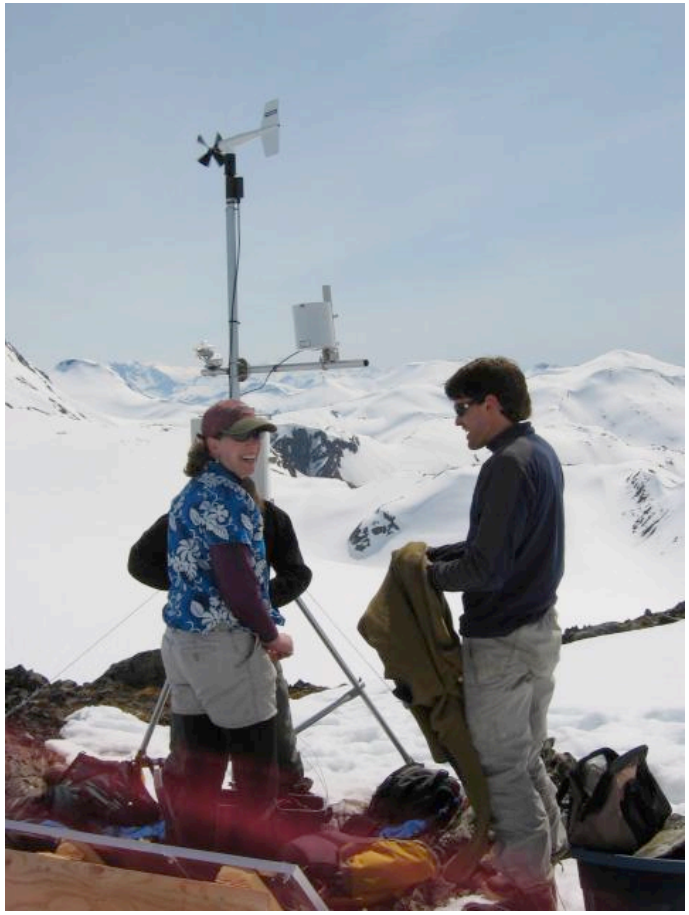
Tmote, tinyOS

Linksys NSLU-2, a UAS testbed platform, Linux

Deployment-ready tmote



Transducers



A combination of weather and water quality measurements provided the main data streams for SEAMONSTER in year 1.

Goals of SEAMONSTER

- Implement Event -> End User Sensor Web
  - Technology Testbed
  - Technology Infusion
  - Education

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- How to?

Collaboration

Collaboration

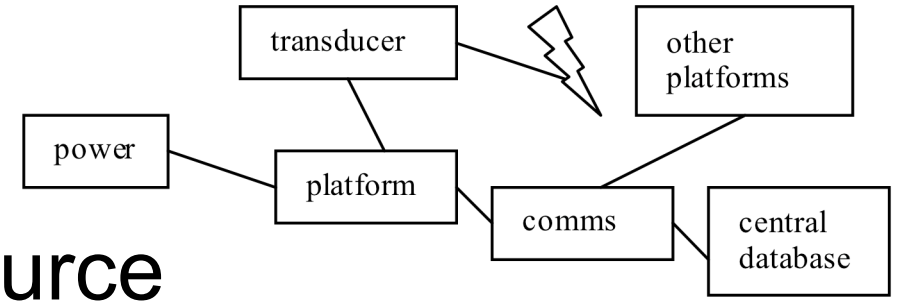
Agents are needed to reconfigure data acquisition based on observations and power states.

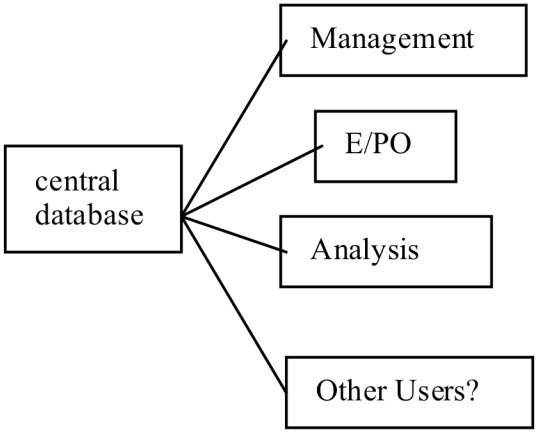
Ex: If the lake pressure transducer measures a drop in lake level:

1. Retask the camera to focus on the lakes
2. Alert systems down glacier to collect (relax power management)

SEAMONSTER Architecture

- Modularity
- Scarce Resource Allocation
- Redundancy
- Event to End User





Role of IPY

- IPY is a year(s)
- Legacy of IPY

- Legacy of IGY

Conclusions

- SEAMONSTER is a testbed sensor web
- SEAMONSTER is training scientists and citizens to use this new paradigm of sensing
- Compelling Use Case
- Key Architectural Concepts:
  - Modularity
  - Digital Earth

http://seamonsterak.com/