

Community Remote Sensing

A New Biodiversity Tool

GEO BON Implementation Plan Meeting
Pacific Grove, CA

24 February 2010

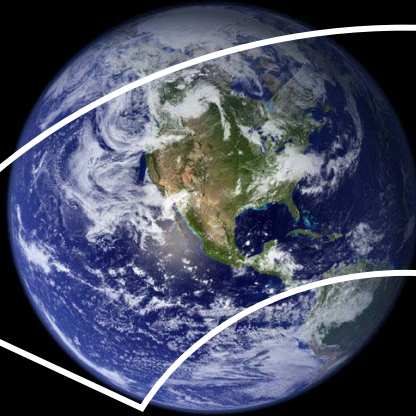


William B. Gail
Microsoft® Corporation
IEEE Geoscience & Remote Sensing Society

The Remote Sensing Scale-Gap

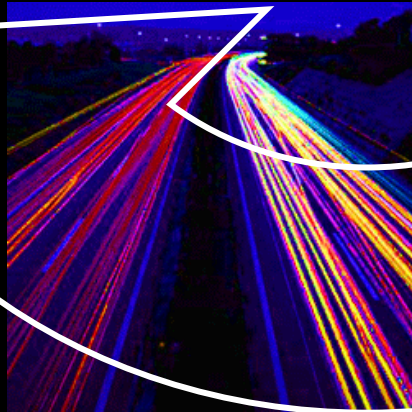
WE DO WELL AT LARGE SCALES

- Weeks to Years
- Kilometer -Scale



WE DO POORLY AT FINE SCALES

- Seconds to Minutes
- Centimeter -Scale



What is Community Remote Sensing

LOOSE DEFINITION

Community reflects the role of *decentralized* individuals rather than *centralized* systems - either common citizens or volunteer professionals

Remote Sensing reflects use or collection of data from a distance - activities that differ from strict mapping or in-situ data collection

RELATED FIELDS

- Volunteered Geographic Information (VGI)
- Participatory GIS
- Citizen Science
- Citizens as Sensors
- Community Mapping
- Geo-Social Networking

FORMS OF CRS

- Data collection
- Calibration/validation
- Analysis
- Applications

		COLLECTION	
		Centralized	Community
ANALYSIS	Community	CRS	CRS
	Centralized		CRS

The Power of Community Remote Sensing

Courtesy Scott Blair/NWS



Courtesy ImageCat

VDV

Virtual Disaster Viewer

<http://www.virtualdisasterviewer.com>

Viewing event: 2009 L'Aquila Earthquake (change) Home - Help - About - Results - Login

2D 3D | Road Aerial | Bird's eye

Information

Id: 951
 Damage Level: 4
 Comment:
 Building completely destroyed by landslide. Not recognizable in post-event image

Event Imagery

YingXiu Pre-Event

YingXiu Post-Event

At least one of the Event Imagery checkboxes must be checked to view high resolution satellite imagery. (help)

Analysis Results

Building Damage

Infrastructure Damage

Landslide Areas

Landslide Blocking Road

Tent Count

Tent Clusters (inactive)

Show Statistics

Field Data

Show Video Stills

Show Photos

(Click on to preview photo)
 (upload photos)
 (most recent photos)
 (most recent photo comments)
 (search photo comments)

Photo courtesy of EERI. © 2008 EERI

Author's comment: Structure type: School, No. of stories: 3, Construction details: RC frame, masonry infill walls, concrete floors and roof, damage state: Collapse

[View Comments](#)

<p>Building Damage</p> <ul style="list-style-type: none"> Indistinguishable Slight / No Damage Extensive Damage Collapse 	<p>Infrastructure Damage</p> <ul style="list-style-type: none"> Indistinguishable Serviceable Spans collapsed Completely collapsed
---	---

bing 600 yds

© 2009 Microsoft Corporation © AIN © 2009 DigitalGlobe

Biodiversity Inventory

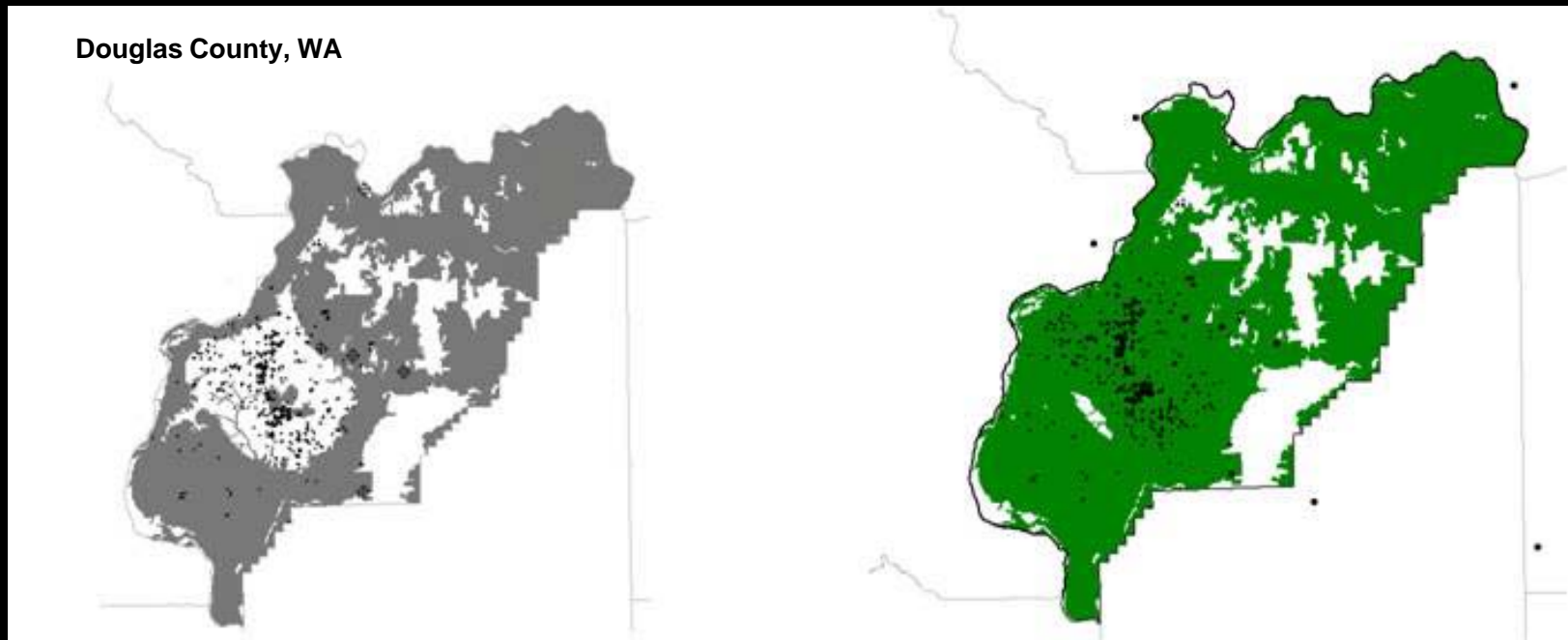
Project

NatureMapping

The University of Washington – College of the Environment, Washington Department of Fish and Wildlife, Waterville School District, and Pierce County Biodiversity Alliance

CRS Relevance

Community-based observational sampling of ecological habitats to validate and refine centralized databases of remotely sensed data



The predicted distribution range of the short-horned lizard (*Phrynosoma douglasii*)

The actual range after updating with farmer's observations (noted by points)

Systematic Biodiversity Monitoring

Project

Digital Earth Watch and Picture Post Network

University of New Hampshire with the Federation of Earth Science Information Partners, Worcester Polytechnic Institute, and the University of Southern Maine

CRS Relevance

A community network and simple sensor platform for systematic monitoring of local environmental conditions



Building a Picture Post

The Digital Earth Watch Network

Biodiversity Management

Project

Fire Alert System

Conservation International

CRS Relevance

Community-based tools to augment real-time satellite monitoring of forest fires, illegal logging, and encroachment



Fire Alert System notification imagery showing fires in two areas of Madagascar, obtained from the Terra satellite

Invasive Species

Project

Participatory Sensing

Center for Embedded Networked Sensing (CENS), UCLA

CRS Relevance

Citizen use of mobile phones and associated web services to gather imagery and related information for 'participatory' environmental monitoring, with applications such as invasive species.



Students using *What's Invasive*

What's Invasive! Android mobile phone client for the Santa Monica mountains

Biodiversity Assessment

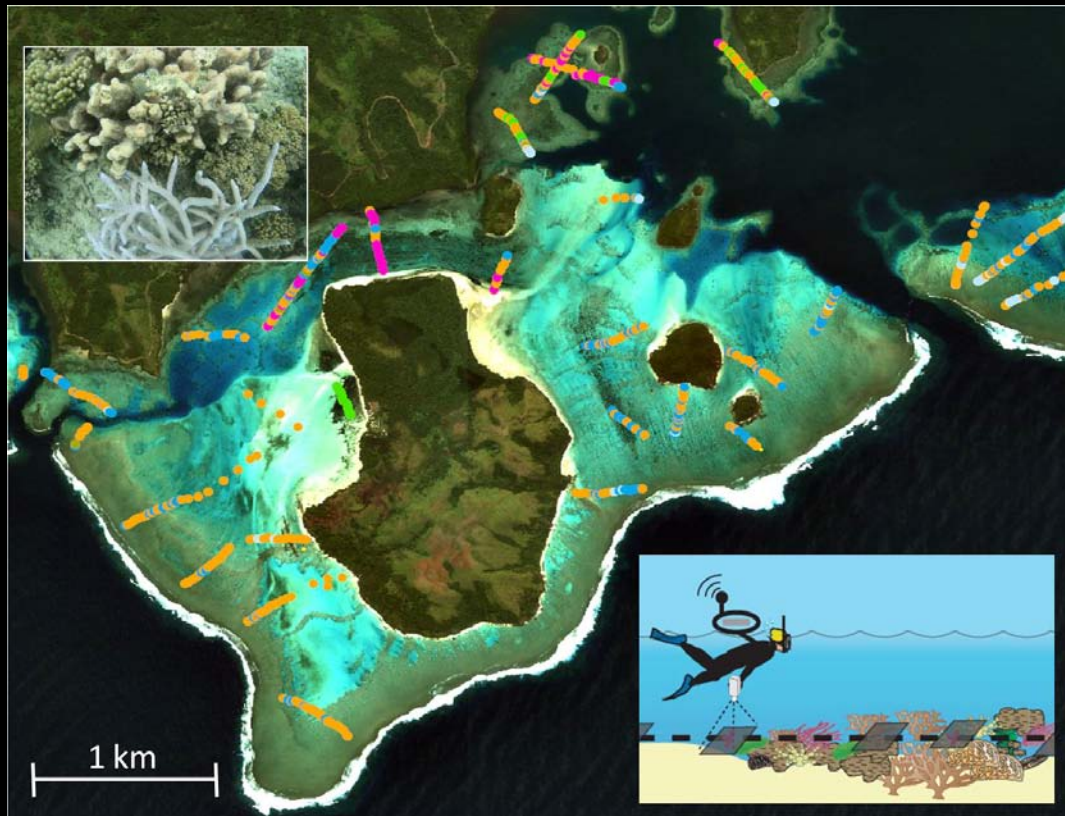
Project

Coral Reef Habitat Mapping

University of Queensland, supported by Wildlife Conservation Society, South Pacific Applied Geosciences Commission, and University of South Pacific

CRS Relevance

Geo-referenced photo transects of coral reefs by individual Fijian and Cook Islanders to augment satellite imagery



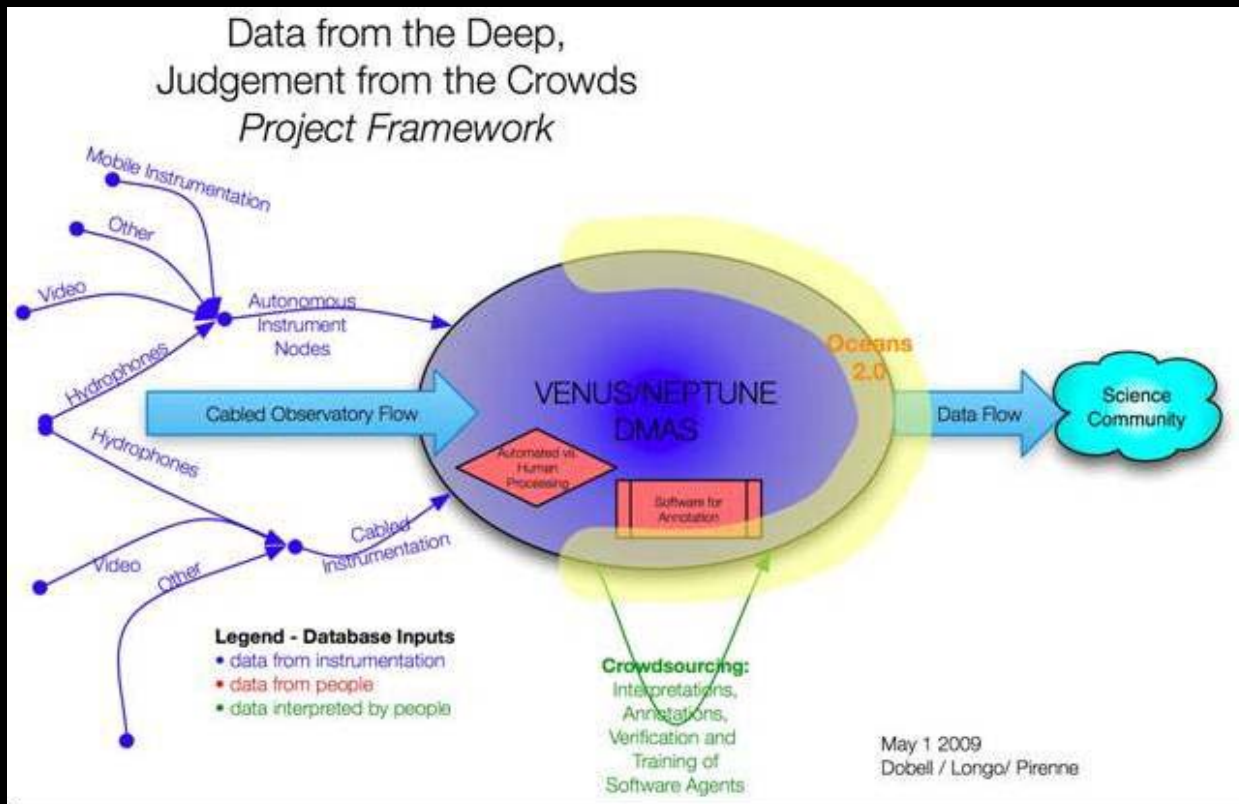
Geo-referenced photo transects distributed over a coral reef environment

- Collected and analyzed by Fijian islanders
- Color represents benthic composition derived from each photo

Ocean Biology Exploration

Project NEPTUNE: Data from the Deep, Judgment from the Crowds
University of Victoria

CRS Relevance **Community-contributed quality control, validation, and analysis of networked ocean sensor data**



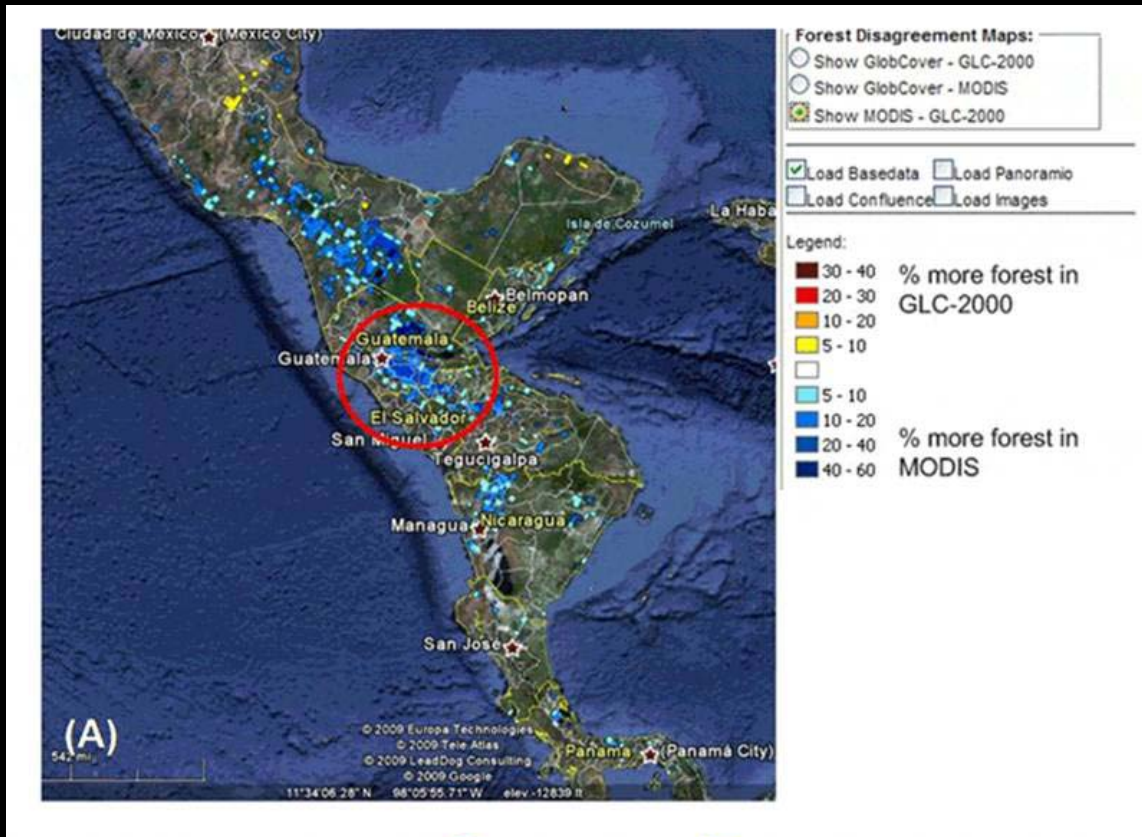
NEPTUNE project framework

Forest Inventory & Monitoring

Project World Forest Observatory

Resources for the Future

CRS Relevance **Wiki-based community remote sensing tools for performing a fine-scale global census of forest attributes**



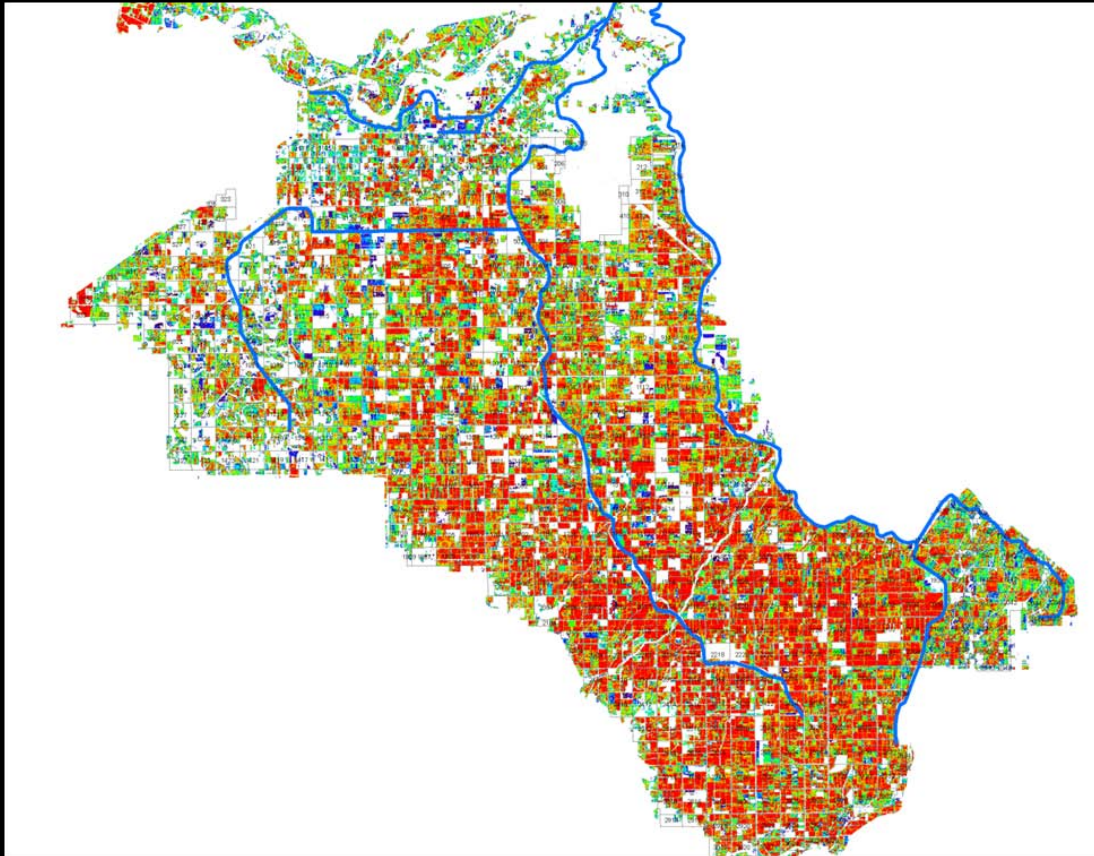
Forest cover classified by GLC2000 and by MODIS and the disagreement between them

The red circle identifies a hot spot of disagreement in Guatemala and El Salvador

Biodiversity Tool Validation

Project Wheat Farming in Yaqui Valley
 Stanford University

CRS Relevance **Web tools for gathering user feedback on usability and value of
remote sensing data sources**



Map of Yaqui Valley wheat yields
supplied to individual farmers to gather
feedback on how they make use of such
information

Biodiversity Data from Social Networks

Project

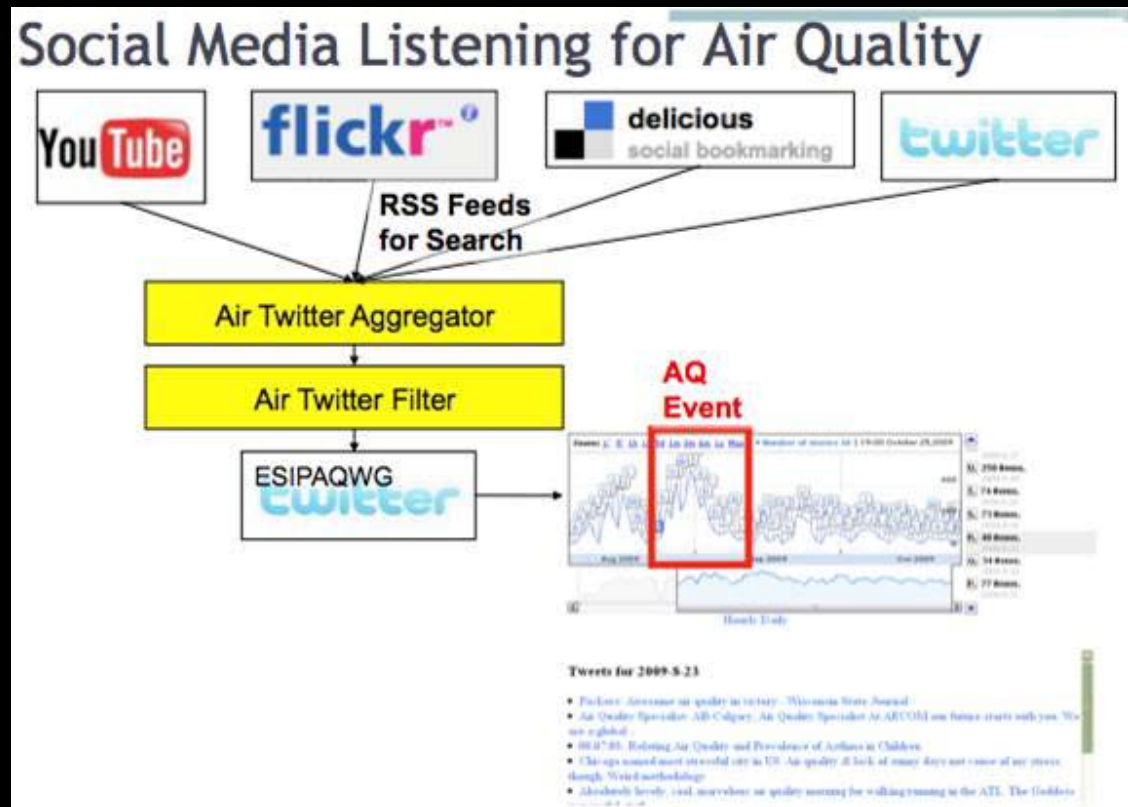
Air Twitter

Washington University in St. Louis, as part of Earth Science Information Partners (ESIP)

CRS Relevance

Use of commercial social networks to 'discover' air quality events for remote sensing analysis

The Air Twitter discovery and analysis process



IGARSS & Community Remote Sensing



- 30th International Geoscience and Remote Sensing Symposium (Honolulu, July 25-30 2010) igarss2010.org
- Plenary headlined by OSTP with CRS as theme, followed by panel discussion with space agency heads
- Website section dedicated to CRS, with Projects (16) and Perspectives

The Vision

Information technologies will provide the foundation for society's rapid progress in the 21st century. Information about the environment (both natural and human-built) is central to this progress. The enormity of the required undertaking – observing and understanding our world at all space and time scales – takes your breath away.

Accomplishing it will be enabled in part by citizens who contribute to 'remotely sensed' versions of the world around them.

Governments will depend on such information to understand local details of climate change and respond to natural disasters. The private sector will use it to build online maps and virtual worlds that make commerce more efficient and accessible.

Within just a decade or so, the influence of community remote sensing will be as profound for understanding our Earth as the satellite revolution has been over the last five decades.