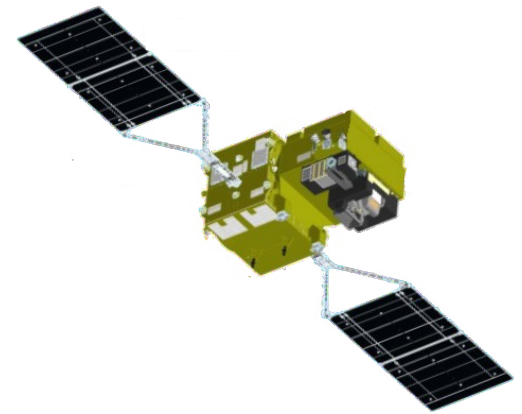


2012/04/03

The Fifth GEOSS Asia-Pacific Symposium:

“GEO Initiatives Towards Green Growth in the Asia-Pacific Region”

@ Miraikan, Tokyo, Japan



Systematic collection of *in-situ* data for validation of remotely sensed information for regional forest carbon monitoring

Kenlo Nishida Nasahara

奈佐原 顕郎

- University of Tsukuba

- Japan Aerospace Exploration Agency (JAXA)

/ Earth Observation Research Center (EORC)



筑波大学
University of Tsukuba



宇宙航空研究開発機構
Japan Aerospace Exploration Agency

in-situ data are critical
for quality assurance of FCT products.

- in-situ* data help you to ...
1. trust or distrust a map.
 2. judge which map is the best.

- Home
- QA4EO Explained
- Workshops
- Documentation
- Resources
- Contact

Providing guidance on the quality assurance of Earth Observation data



Latest Announcements



A QA4EO Workshop on 'Providing Harmonised Quality Information in Earth Observation Data by 2015' took place from 18th - 20th October 2011. The workshop agenda, participants and presentations are available here.

Guidance

Please visit the Documentation page for the latest versions of the QA4EO framework and guidelines.



Classic *in-situ* data for remote sensing:
particularly for **radiometric products** of satellite sensor

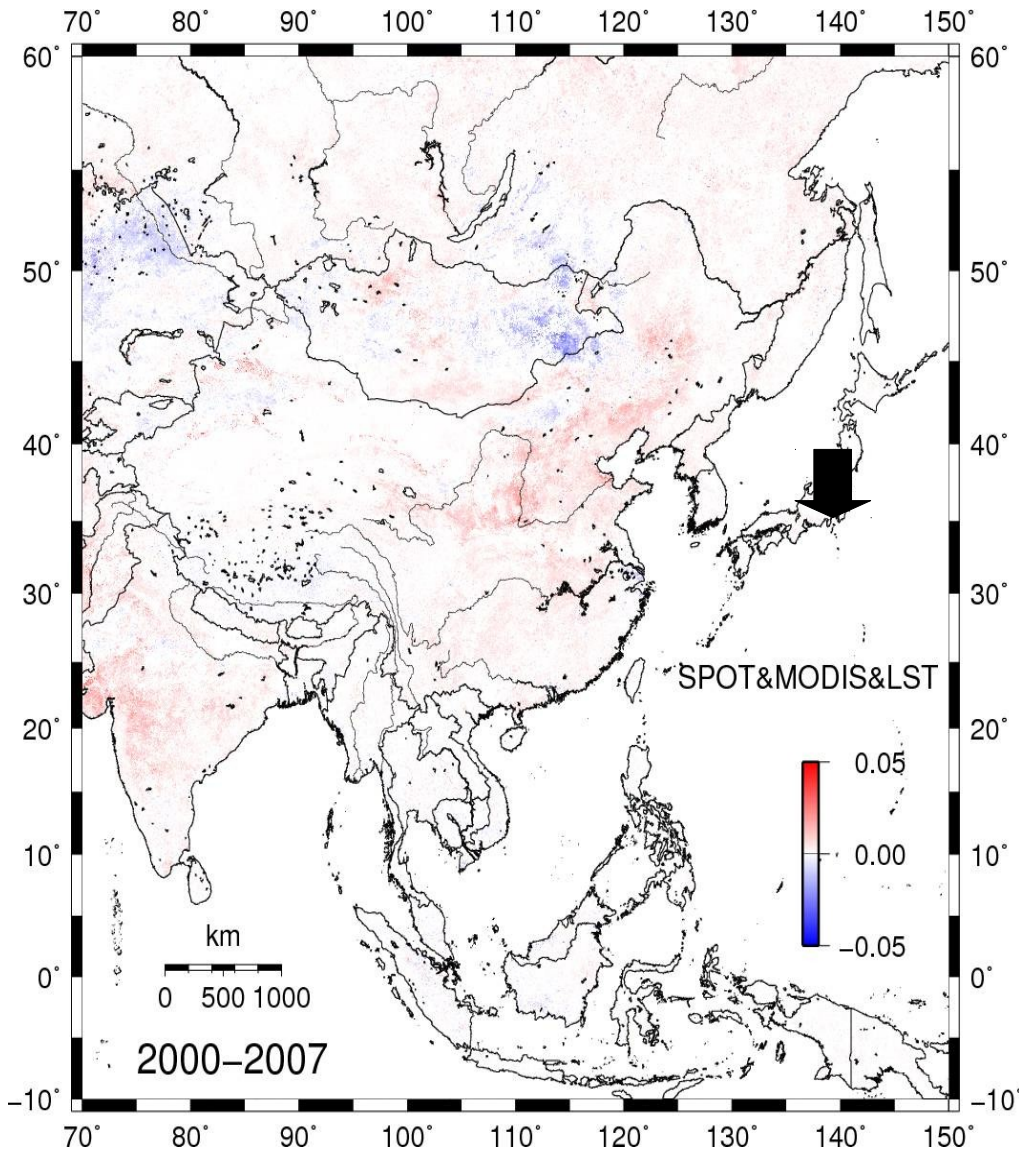
http://www.qa4eo.org/docs/QA4EO-WGCV-IVO-CLP-004_vDraft.pdf



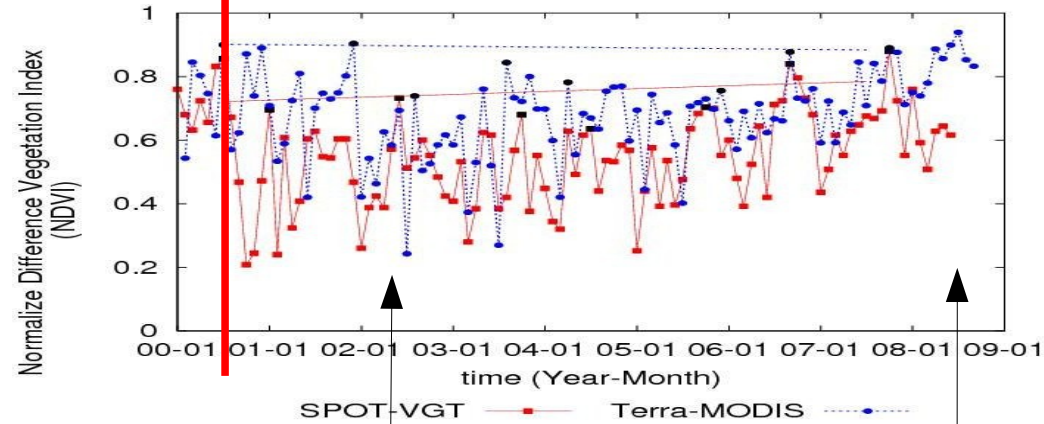
→ *in situ* data = Optical characteristics of the ground surface

But we also need *in-situ* data for **higher level products**:
forest cover, biomass, etc.

Example: Damage & recovery of forest after a volcanic eruption



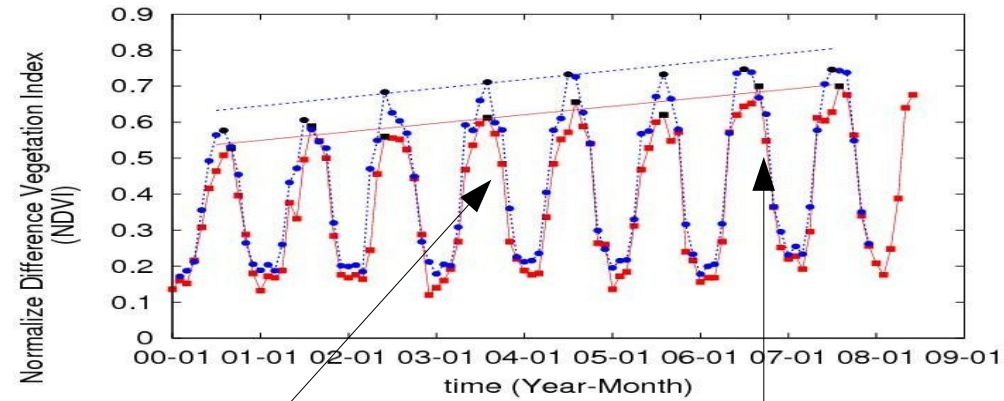
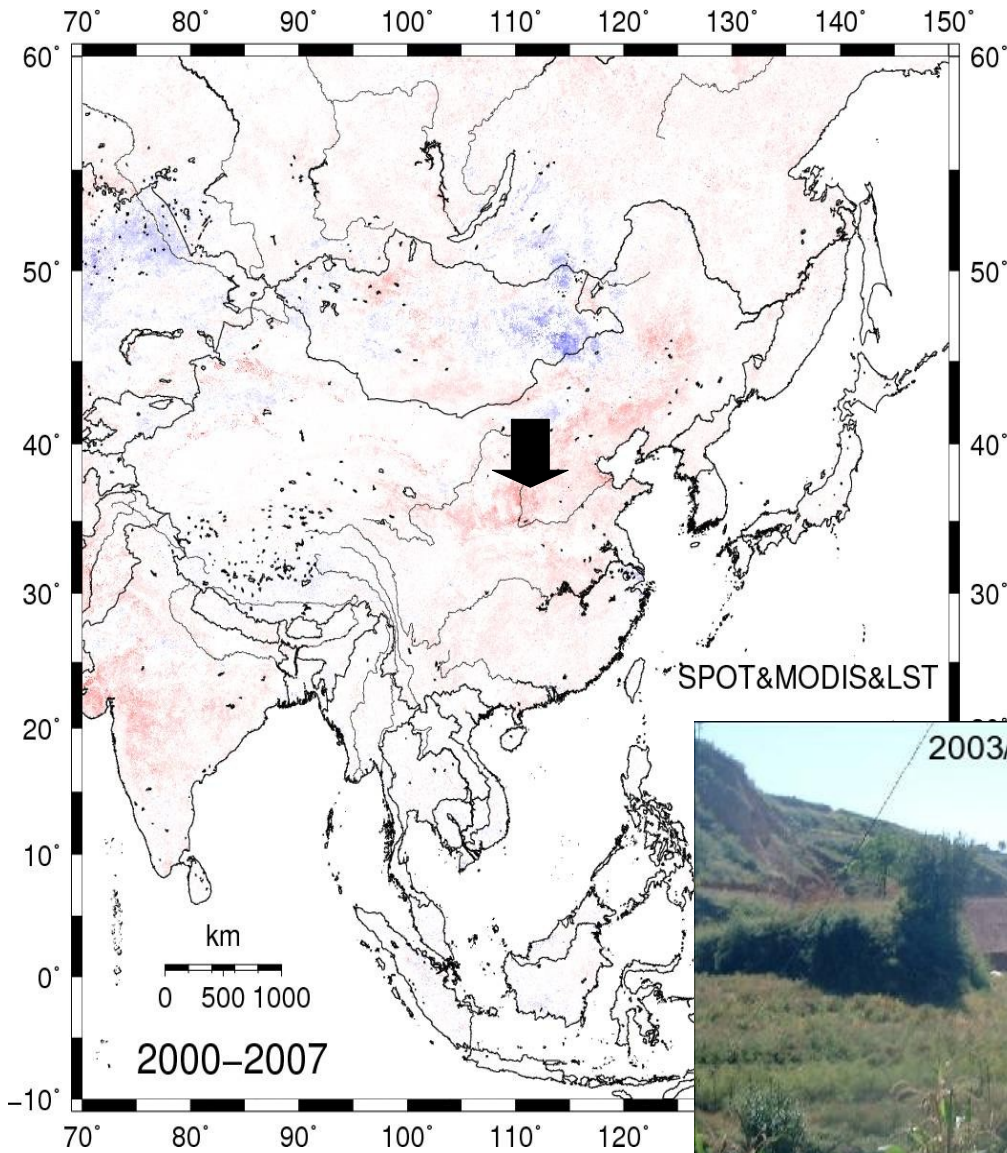
Eruption: July 2000



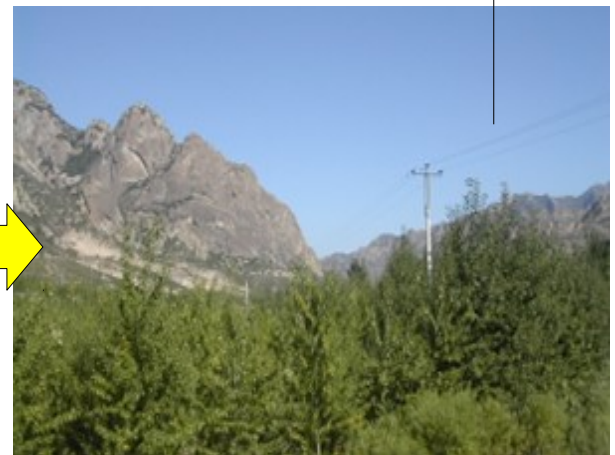
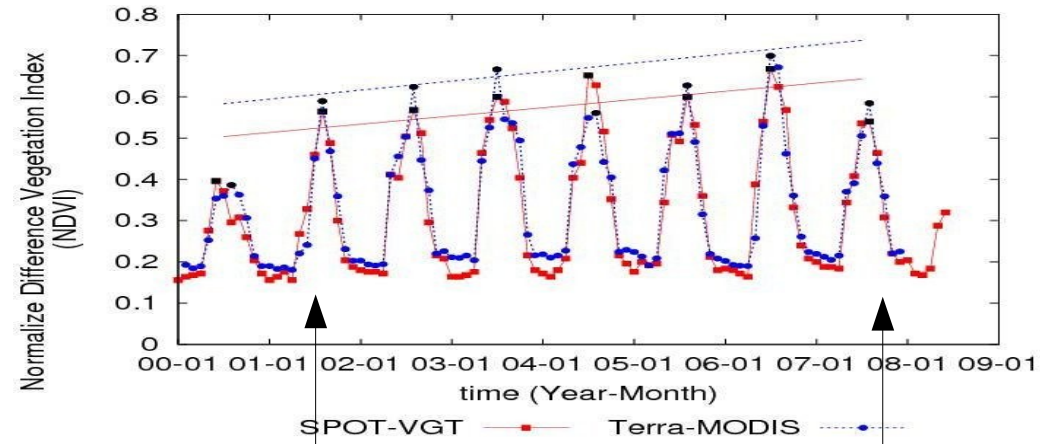
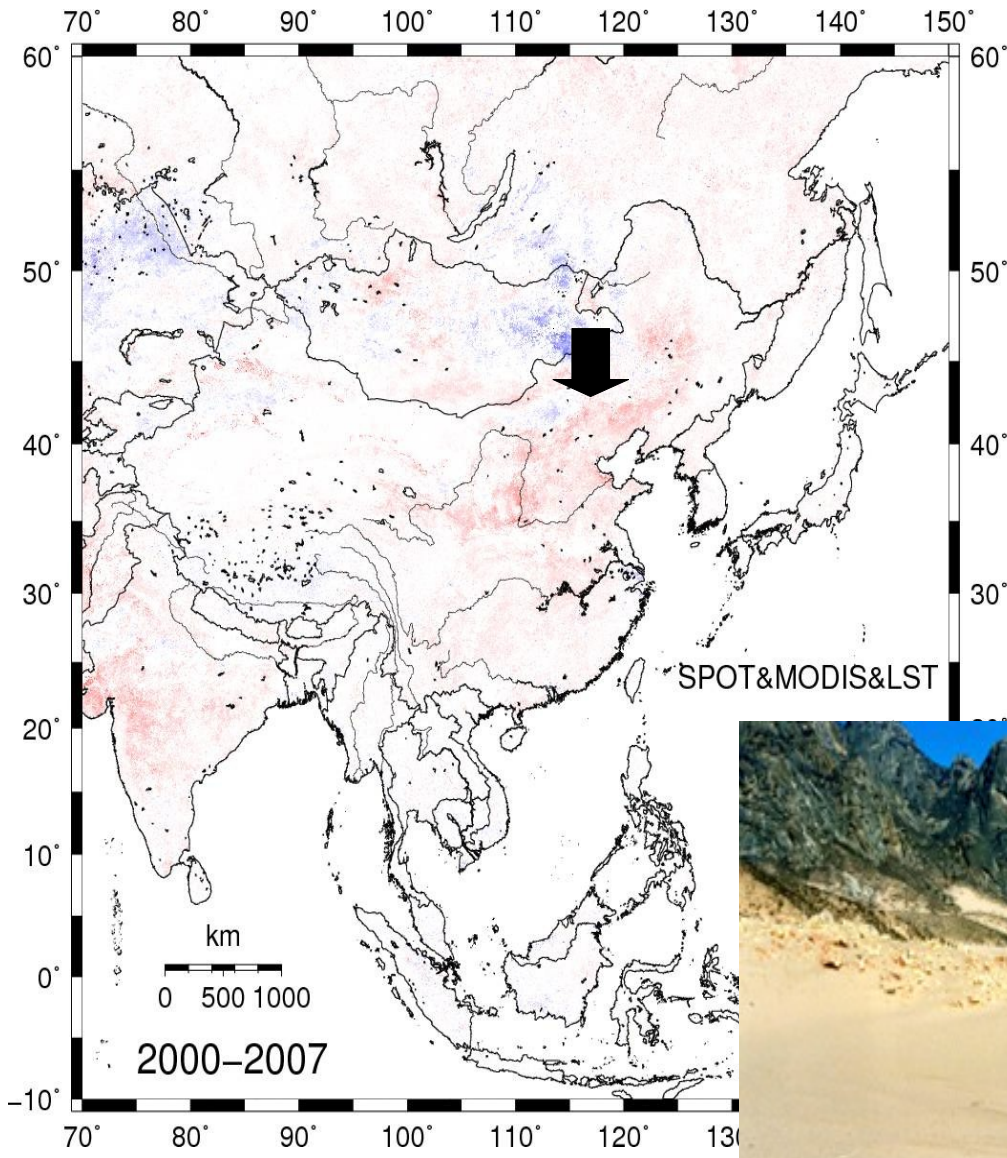
Koyanagi 2009, Master thesis, Univ. Tsukuba

by Prof. Kamijo, Univ. Tsukuba

Example: Aforestation in China

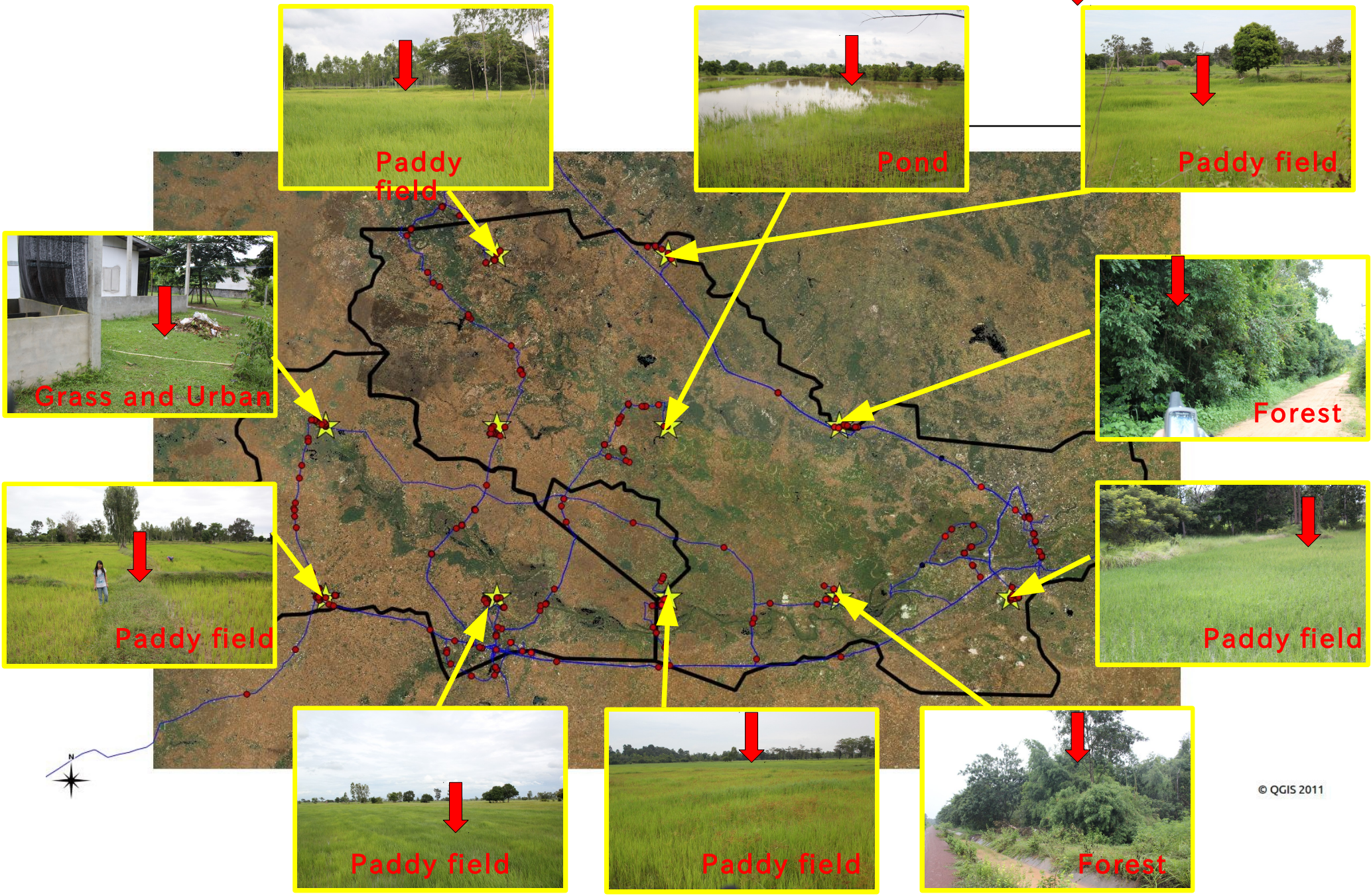


Example: Aforestation in China



Getting *in-situ* data is laborious...

↓ : target points



How can we get, share, and utilize the *in-situ* data systematically?

in-situ data for FCT should be ...

- Open to public (So that everybody can check their reliability.)
- Worldwide (Because FCT products are global.)
- Described comprehensively (geolocation, time stamp, etc.)
- Dynamic (Forest cover changes in time.)

GoogleEarth

ファイル(F) 編集(E) 表示(V) ツール(T) 追加(A) ヘルプ(H)



ジャンプ ビジネスを検索 ルート

ジャンプ 例: 37.407229, -122.107162

お気に入り

観光ツアー
[建物の 3D 表示]レイヤにチェックが入っていることを確認してく

保留

Earth ギャラリー >>

プライマリ データベース

境界線や地名

場所

写真

Panoramio

360 Cities

道路

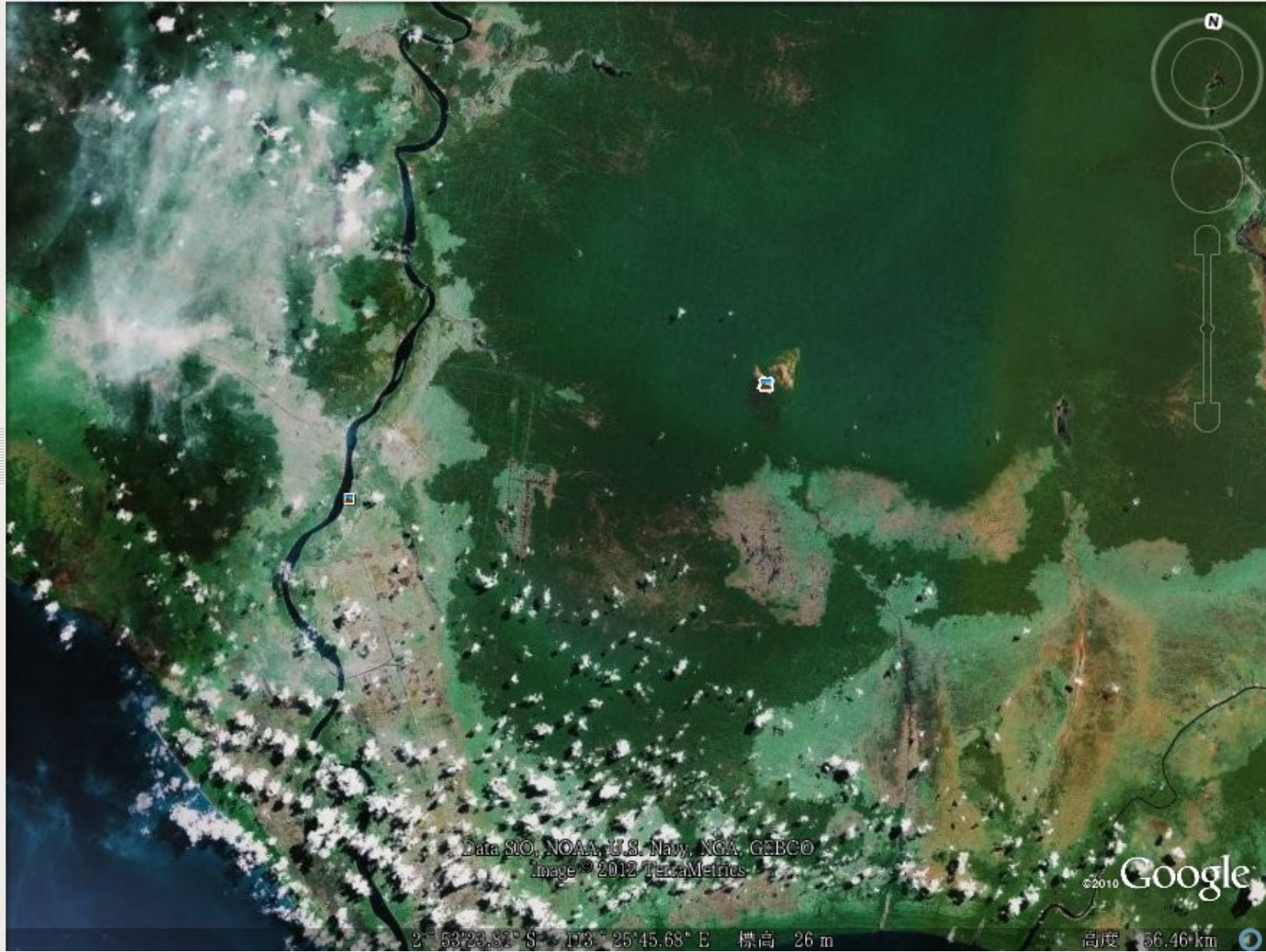
建物の 3D 表示

海

天気

ギャラリー

グローバル アウェアネス



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2012 TerraMetrics
©2010 Google
2° 53' 23.87" S 113° 25' 45.68" E 標高 26 m 高度 56.46 km

photo on GoogleEarth

Valuable source. But no reliable location or time information.

The screenshot shows the Google Earth desktop application. The main window displays a satellite view of a lush green mountainous region. A large photo window is open, showing a panoramic view of a forested hillside overlooking a valley. The photo window includes a title, a description, and a gallery of four smaller images. The interface is in Japanese, with various toolbars and panels visible on the left and bottom.

Jump ビジネスを検索 ルート
ジャンプ 例: 37.407229, -122.107162

お気に入り
 観光ツアー
[建物の 3D 表示] レイヤにチェックが入っていることを確認してください
 保留

Earth ギャラリー >>

プライマリ データベース
 境界線や地名
 場所
 写真
 Panoramio
 360 Cities
 道路
 建物の 3D 表示
 海
 天気
 ギャラリー
 グローバル アウェアネス

Bukit Kaki, Desa Mendawai
By blueparay
Fly to this photo's location
Misplaced?
Inappropriate
Comment it

Panoramio
Upload your photos
Sponsored Links
fujisan223.jp

1/4

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2012 TerraMetrics

©2010 Google
2° 46'22.76" S 113° 17'28.11" E 標高 10 m 高度 56.46 km

field photo library in Univ. Oklahoma

The screenshot shows the website interface in a Mozilla Firefox browser window. The address bar displays the URL: <http://www.acmf.edu/photos/map.php?longmin=-130&longmax=&latmin=>. The page features a header banner for "Earth Observation and Modeling" at the University of Oklahoma. Below the banner is a navigation menu with links: Home, About Us, Dataset, Photo, Visualization, Models, Carbon, GeoHealth, Education, and Workshop. The main content area is titled "Global Geo-Referenced Field Photo Library" and includes a welcome message for user "xlao2007". It contains search filters for coordinates, date, metadata, and region, along with a keyword search field. At the bottom, a world map is displayed with several orange circular markers indicating photo locations.

This screenshot shows the same website in a Japanese browser. The address bar shows the full URL: <http://www.acmf.edu/photos/map.php?longmin=-130&longmax=>. The page layout is identical to the previous screenshot, but the search filters are more detailed. The "Search by coordinates" section includes fields for Longitude min (-130), Longitude max (-90), Latitude min (30), and Latitude max (40). The "Search by date" section has "From" (Jan 1 1990) and "To" (Dec 1 2010) dropdowns. The "Search by metadata" section includes "Categories" (All) and "Users" (All). The "Search by region" section includes "Countries" (All) and "Geographical" (All). A "720 photos" count is shown above the map. A photo popup is visible over the map, showing "Photo id: 26155", a thumbnail image, and the filename "26155P1080840.JPG".

- Not necessarily confluence points
- Geographical concentration is a problem

Degree Confluence Project (DCP) ... a new type of hobby.

The screenshot shows the website for the Degree Confluence Project. The browser address bar displays <http://confluence.org/>. The page features a navigation menu with links for 'Most Visited', 'Red Hat, Inc.', 'Red Hat Network', 'Support', 'Shop', 'Products', and 'Training'. On the left, statistics are listed: 6131 successful, primary confluences; 575 secondary confluences; 349 incomplete confluences; 12204 visitors and 97097 photographs in 184 countries. A 'How To ...' button is present. Below this are 'project links' including Information, Contact us, IRC, Member page, Worldwide maps, Visitor index, Search, and T-shirts. A 'confluence visits' section lists Pending, Antipodean visits, Special visits, and Methods of Transportation. The main content area includes a banner image with the text 'degree confluence project' and a goal statement: 'The goal of the project is to visit each of the latitude and longitude integer degree intersections in the world, and to take pictures at each location. The photos are then posted here.' An 'overview' section explains the project's scope and mentions that 10,214 confluences remain to be found. A '18 newest confluence visits' section is partially visible. To the right, a grid diagram titled 'confluence' shows a 3x4 grid of red dots representing latitude and longitude intersections. The vertical axis is labeled with latitudes 34N, 35N, and 36N. The horizontal axis is labeled with longitudes 138E, 139E, 140E, and 141E. An arrow points to the intersection at 36N, 140E.

“The goal of the project is to visit each of the latitude and longitude integer degree intersections in the world, and to take pictures at each location.”

Degree Confluence Project (DCP)

The screenshot shows a web browser window with the address bar containing `confluence.org/photo.php?visitid=18244&pic=6`. The browser's address bar also shows the page title "Degree Confluence Project". Below the address bar, there are several navigation buttons: "Most Visited", "Red Hat, Inc.", "Red Hat Network", "Support", "Shop", "Products", and "Training". The main content area displays a photograph of a yellow Garmin handheld GPS device. The device's screen shows the following information:

HÖHE
544 ^m
POSITION
N 49°00.000'
E 013°00.000'
LÄNGE/BRTE
N 49°00.000'
E 013°00.000'
UHRZEIT
12:00
SO-UNTGANG
17:03

The device is a GARMIN brand. A red arrow points from the coordinates "E 013°00.000'" on the device screen to a text box on the right side of the browser window.

People satisfy themselves watching many zeros.

<http://confluence.org/>

Degree Confluence Project (DCP)

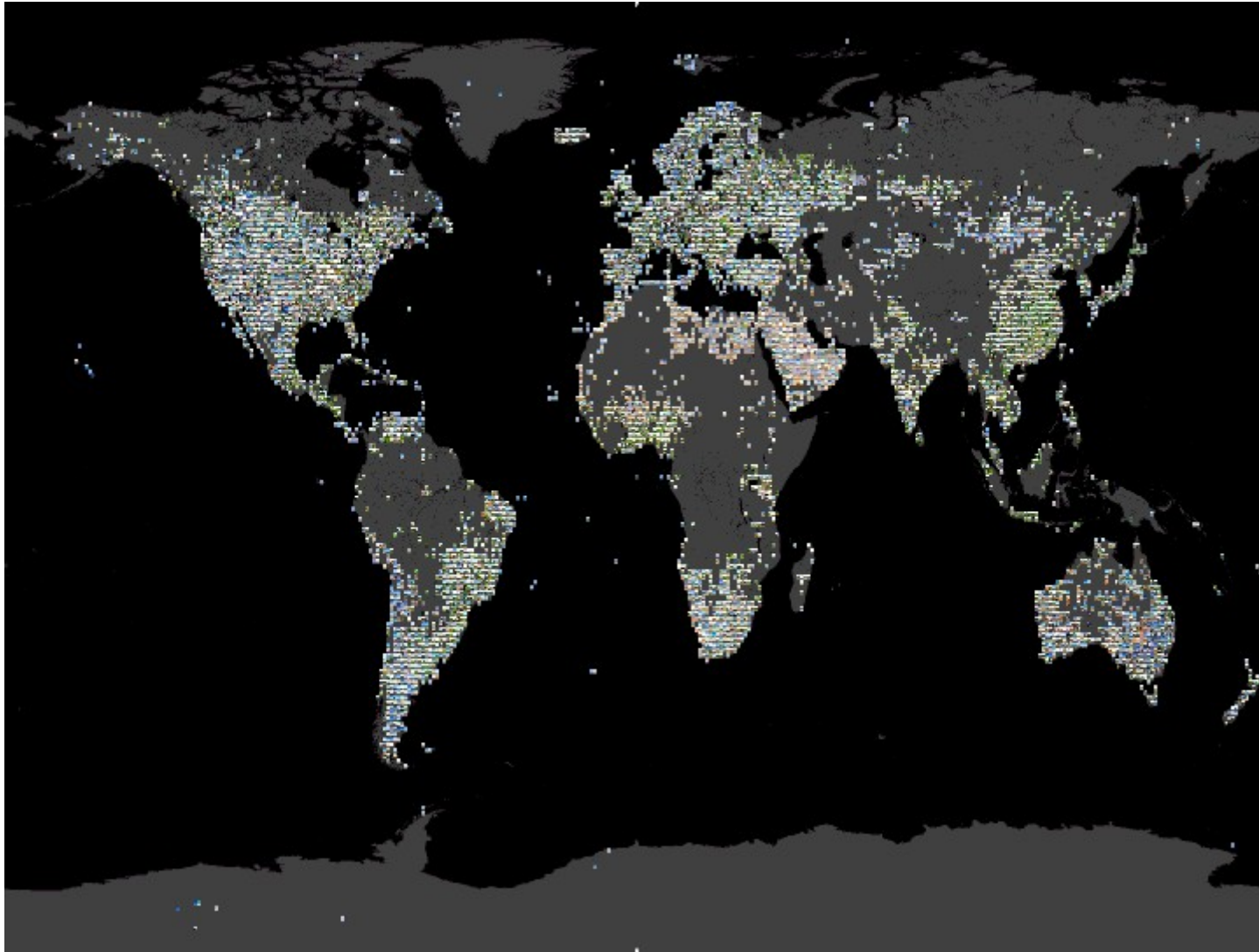
The screenshot shows the website interface for the Degree Confluence Project. At the top, there is a browser address bar with the URL `confluence.org/confluence.php?visitid=18244`. Below the address bar is a navigation menu with links for 'Main', 'Search', 'Countries', 'Information', 'Member Page', and 'Random'. The main content area features a globe with 'Degree Confluence Project' written on it, surrounded by cardinal directions (N, NE, E, SE, S, SW, W, NW). To the right of the globe, a blue header displays the coordinates '49°N 13°E (visit #10)'. Below this header is a grid of ten small photographs, each with a number and a date in brackets, such as '#8: [10-Jun-08]' and '#1: [17-Mar-01]'. On the left side of the page, there is text describing the location: 'Germany : Bayern', '1.2 km (0.7 miles) W of Ruhmannsfelden-Vorderdietzberg, Bayern, Germany', and 'Approx. altitude: 554 m (1817 ft)'. It also includes links for maps and the antipode. At the bottom right, there is a note '(visited by Hansen Ohnesorge)' and a language selection link for 'English'.

<http://confluence.org/>

Lots of information: geolocation, date, photos, text in detail, ...
--> useful *in-situ* data for satellite products! (Iwao *et al.*, 2006 GRL)

Degree Confluence Project (DCP)

Coverage of the confluence points already visited



- There are 14,029 confluence points (excluding ocean).
- About 6,000 confluence points have been visited.

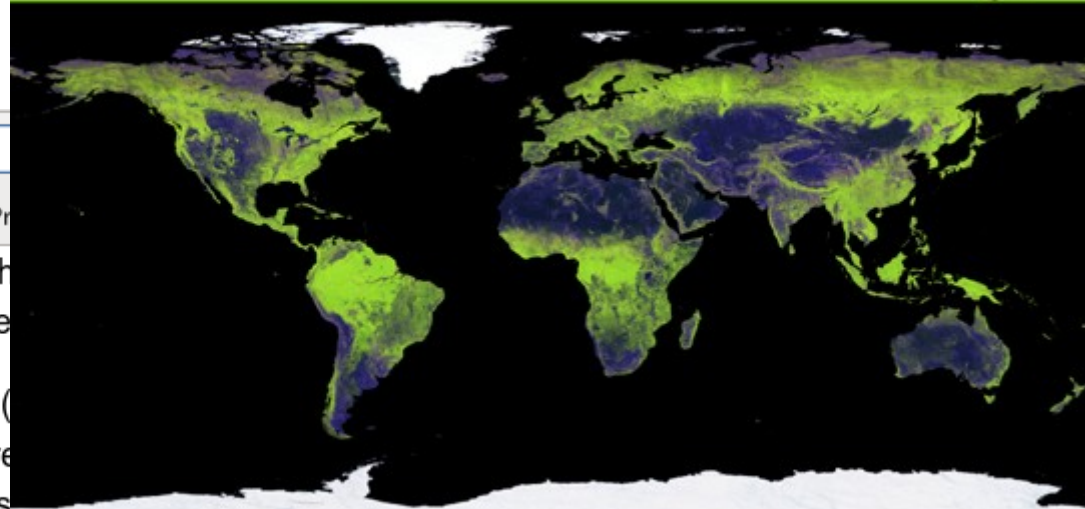
<http://confluence.org/>

Degree Confluence Project (DCP): application

↓
in-situ data for
validation of
JAXA Forest Map



PALSAR 10m Global Mosaic 2009



©JAXA, METI Analyzed by JAXA

R:HH G:HV B:HHV

www.eorc.jaxa.jp/ALOS/en/guide/forestmap_oct2010

visited Red Hat, Inc. Red Hat Network Support Shop Pr

poral
sistencies
r
-continental
le.

search
nouncement

for research
posal using
OS products.

nference

polarization) and blue on their ratios. Greenish
forestry, and dark green to yellow are non-fore

Figure 2 is the Global Forest/Non-forest Map (colors to indicate forests in green and non-fore
yellow, where forest is defined as the biomass
ton/hectar. The accuracy of the forest/non-fore

by this image is confirmed to be 84% compared to the ground
base data set^{*3}.

Figure-3 is partially enlarged images to show the Amazon,
Africa and South-East Asia. Concerning South-East Asia.

the land.

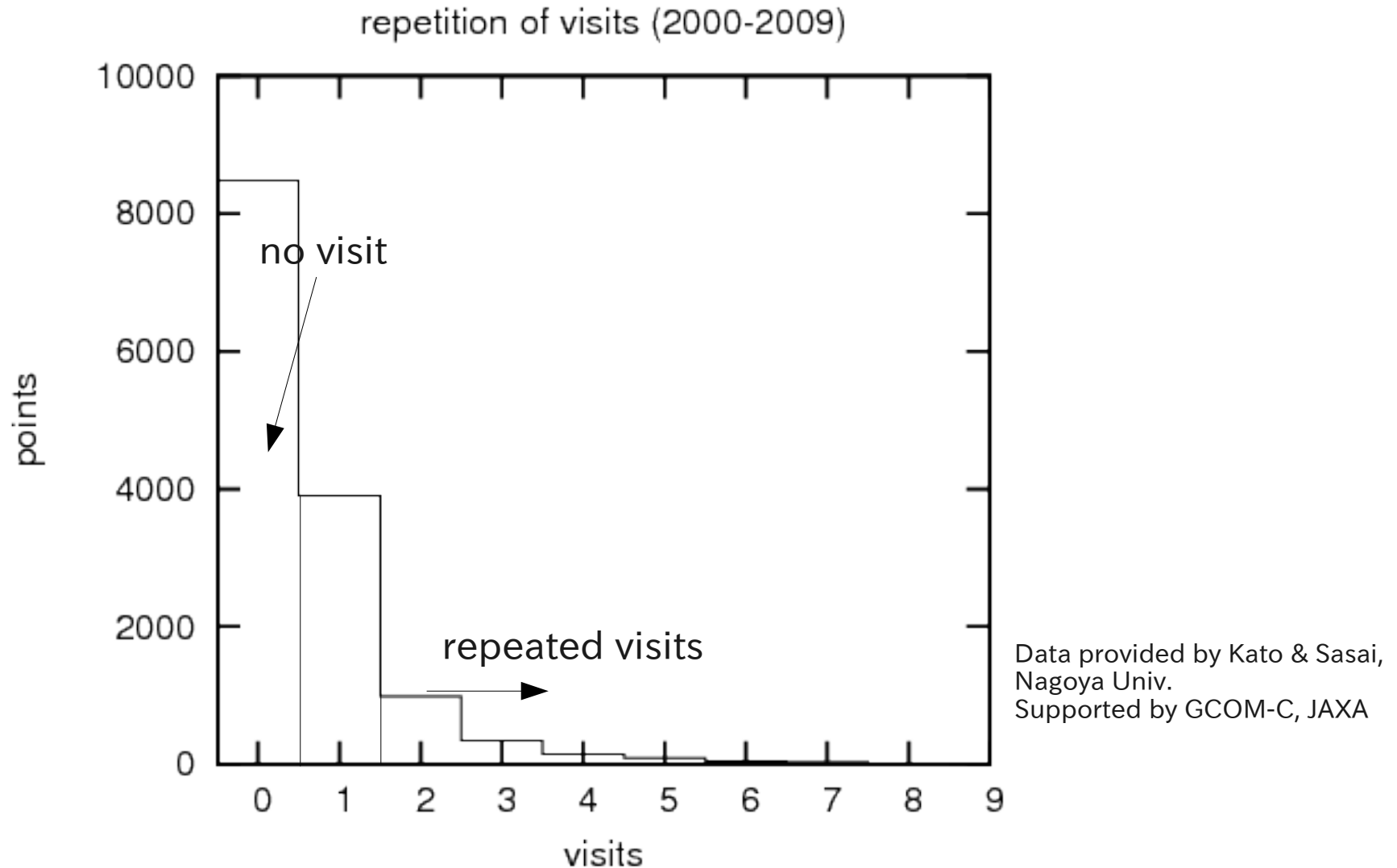
*3 Ground truth data set: data that is compiled based on local
data of each one-degree square area in latitude and longitude
gathered from the Degree Confluence Project

(<http://confluence.org/>)

JAXA Public Affairs Dep

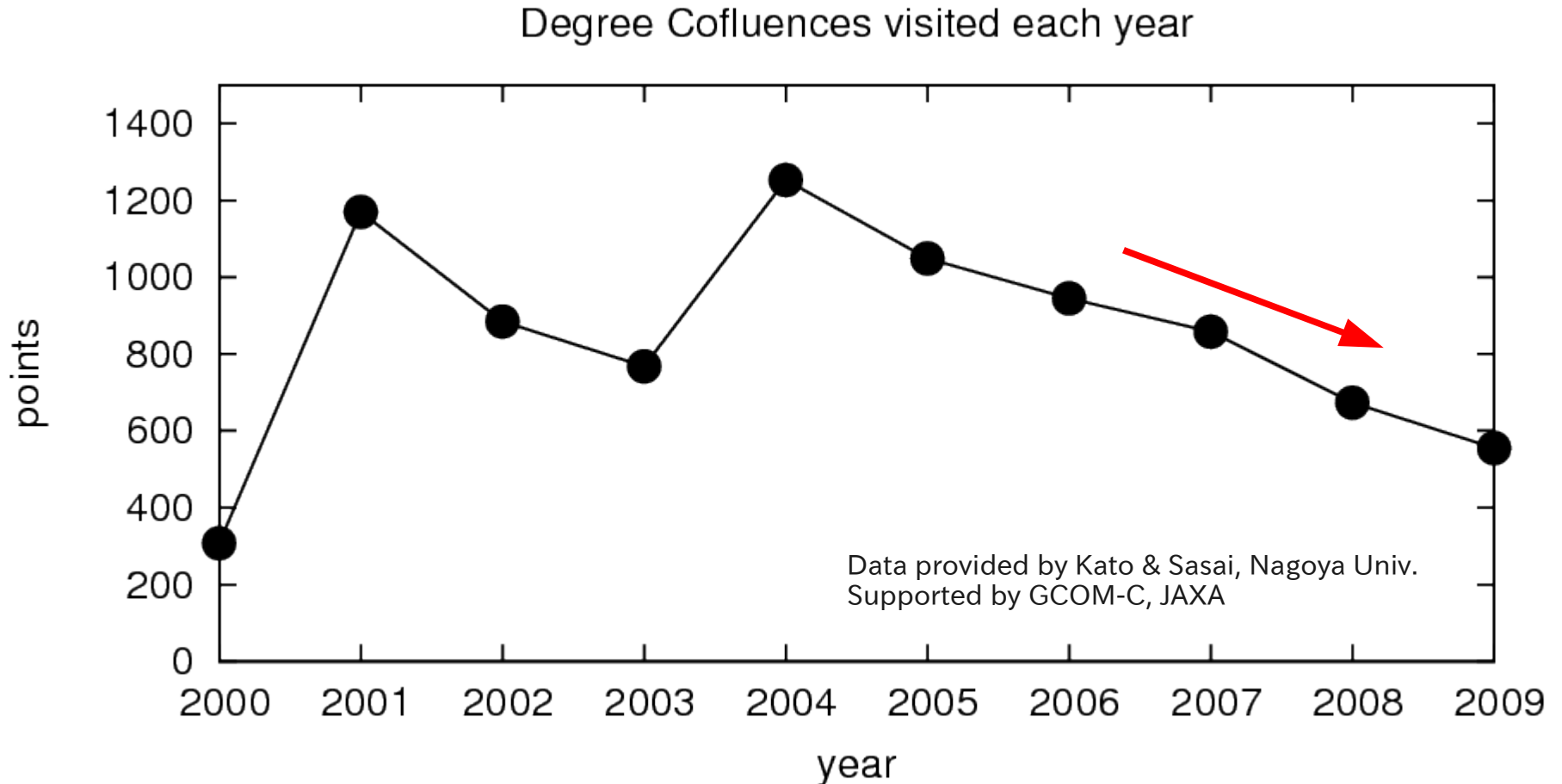
http://www.eorc.jaxa.jp/ALOS/en/guide/forestmap_oct2010.htm

Degree Confluence Project (DCP): problem



- More than half of the entire confluence points have never been visited.
- Few points have been visited repeatedly.

Degree Confluence Project (DCP): crisis?



- Number of visits (including repetition) is decreasing.
- People may be **loosing passion** for this hobby.

What if you want more than single photos?



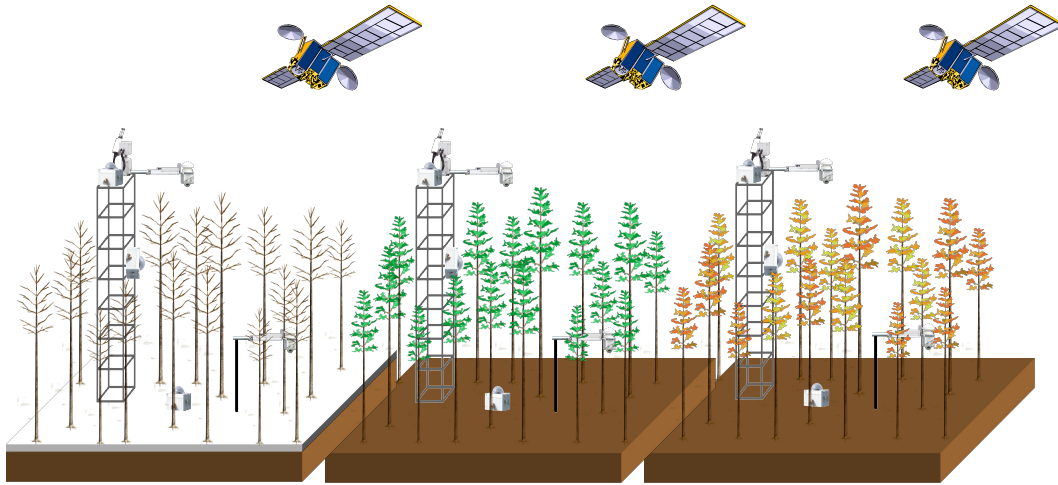
Collaborate with scientific “ground networks.”

- PEN

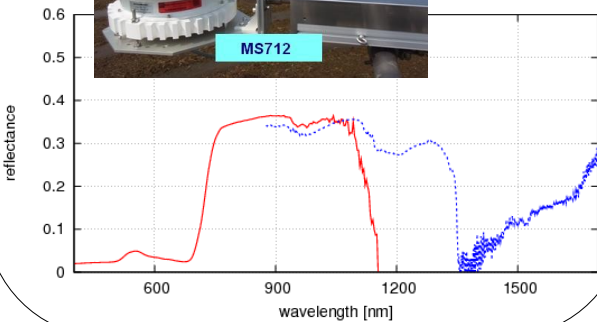
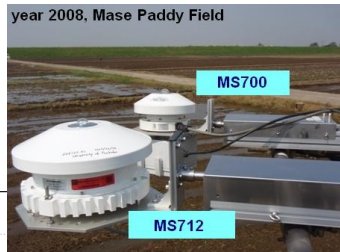
- ILTER / JaLTER / Moni1000

- FluxNet / AsiaFlux / JapanFlux

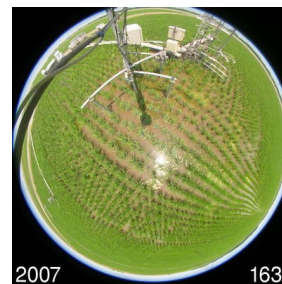
PEN (Phenological Eyes Network) ... 2003- Connecting remote-sensing and ground



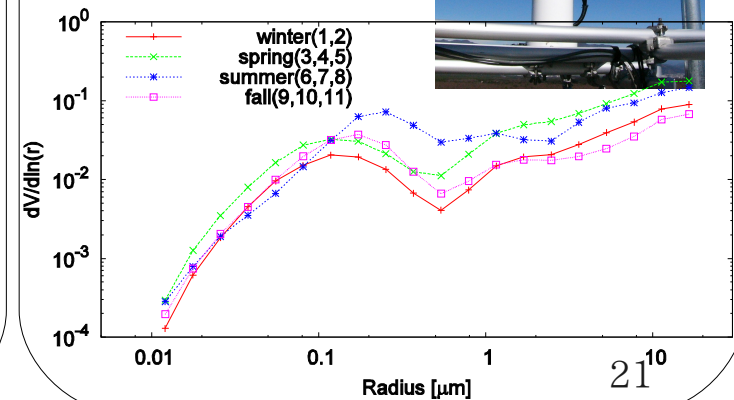
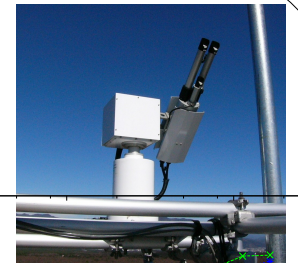
Automatic spectrometer (VIS/NIR/SWIR)



Automatic Digital Fish-Eye Camera



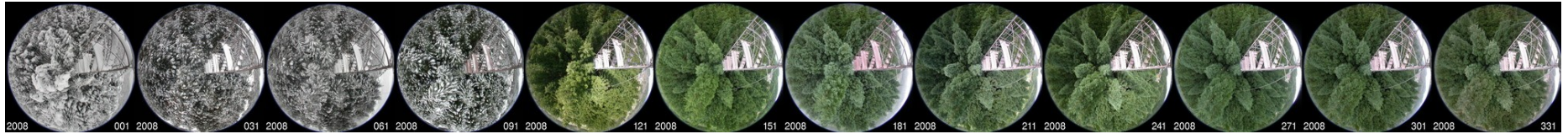
Sunphotometer (for aerosol)



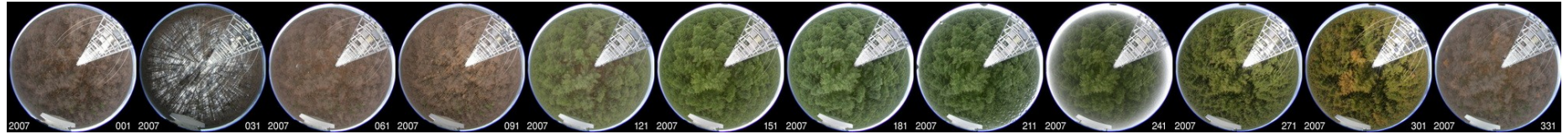
Key1: Seasonal change

常緑針葉樹林 (高山C50サイト; スギ)

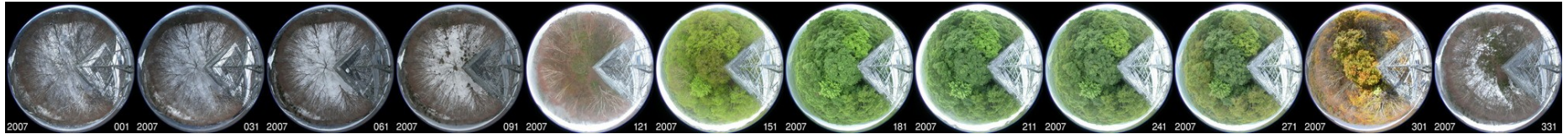
自動魚眼デジカメによる群落定点写真 (PEN)



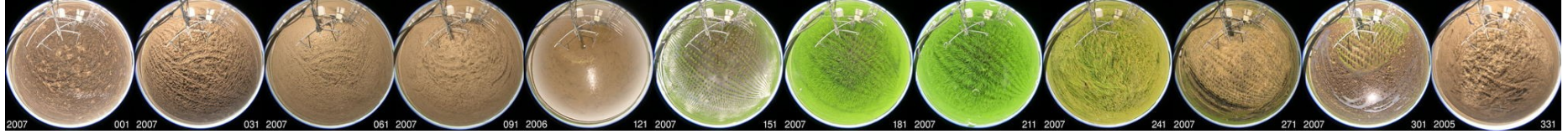
落葉針葉樹林 (富士北麓サイト; カラマツ)



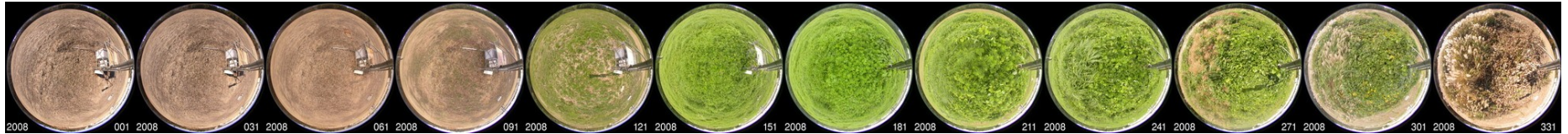
落葉広葉樹林 (高山サイト; ダケカンバ・ミズナラ)



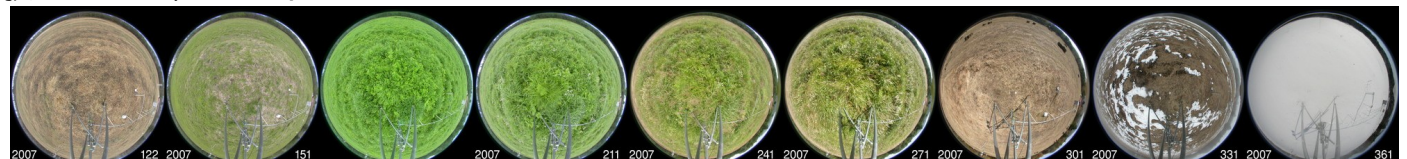
水田 (真瀬サイト; コシヒカリ)



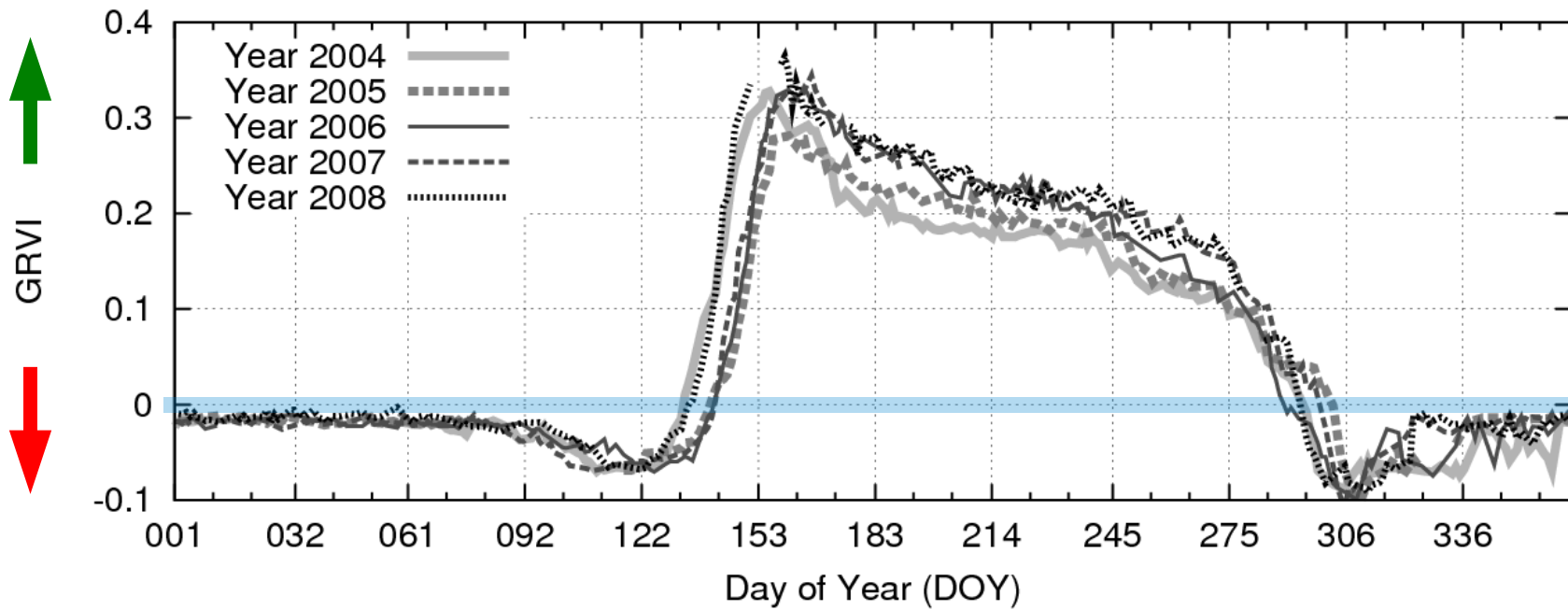
草原 (筑波大TERC; ススキ・セイタカアワダチソウ・クズ)



草原 (筑波大学菅平高原実験センター; ススキ)

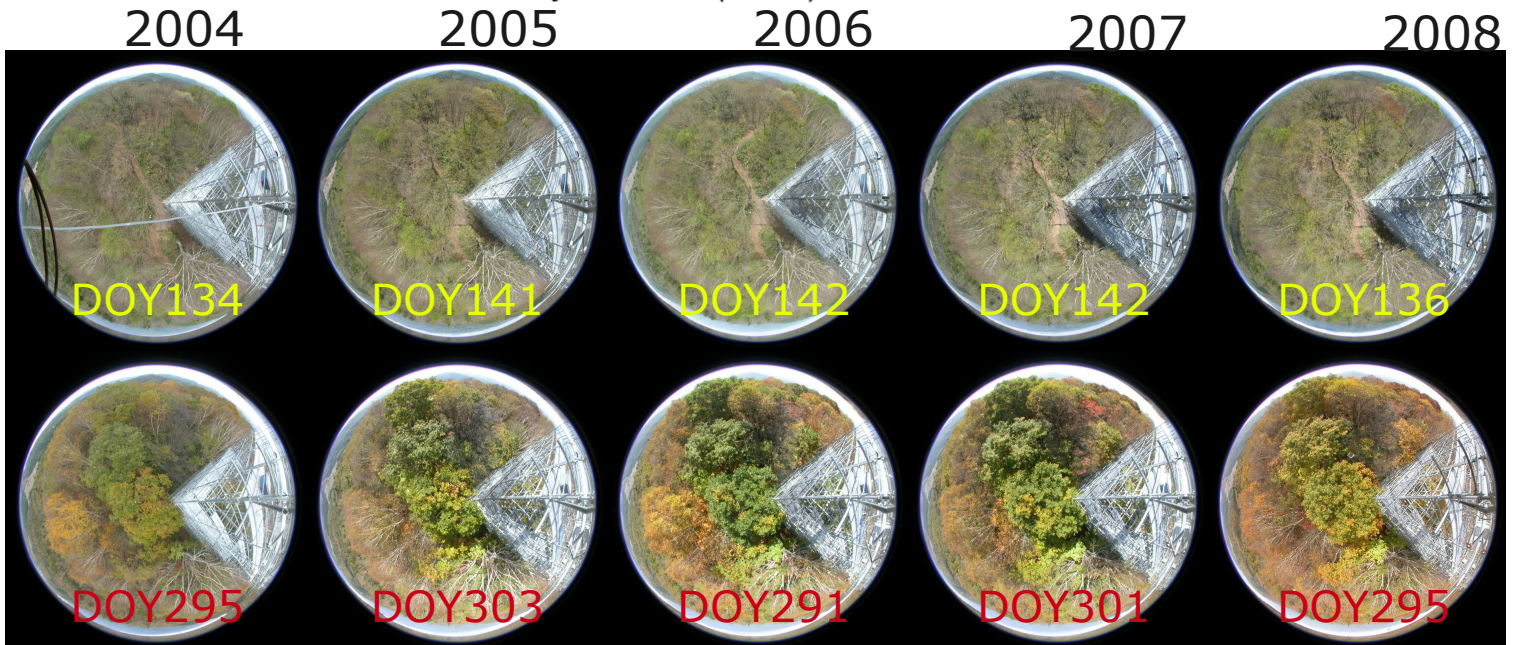


PEN (Phenological Eyes Network)



Spring

GRVI=0



Autumn

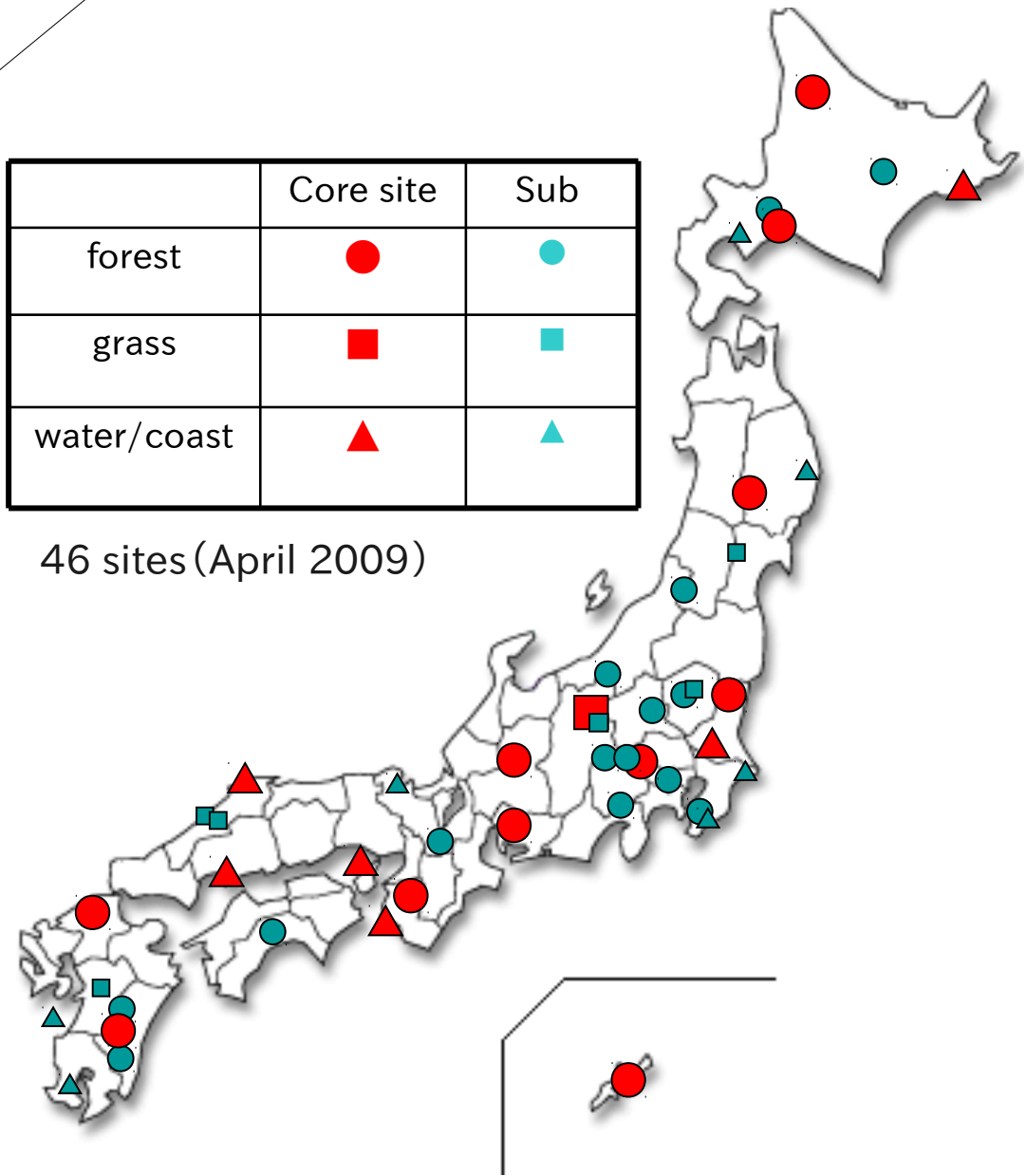
GRVI=0

ILTER (International Long Term Ecological Research Network)



	Core site	Sub
forest	●	●
grass	■	■
water/coast	▲	▲

46 sites (April 2009)

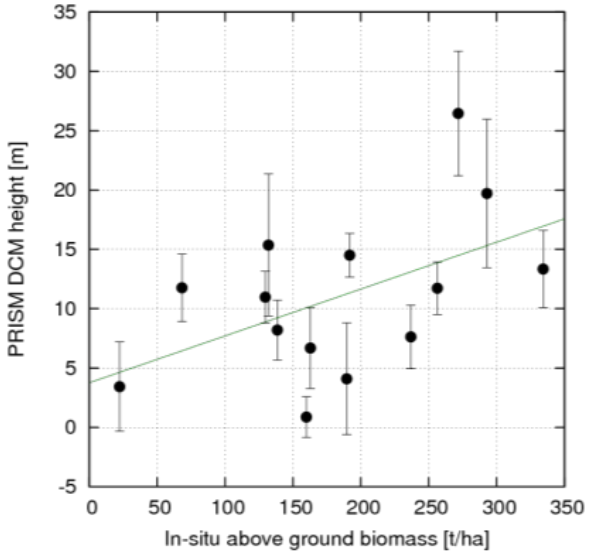


Forest biomass estimation

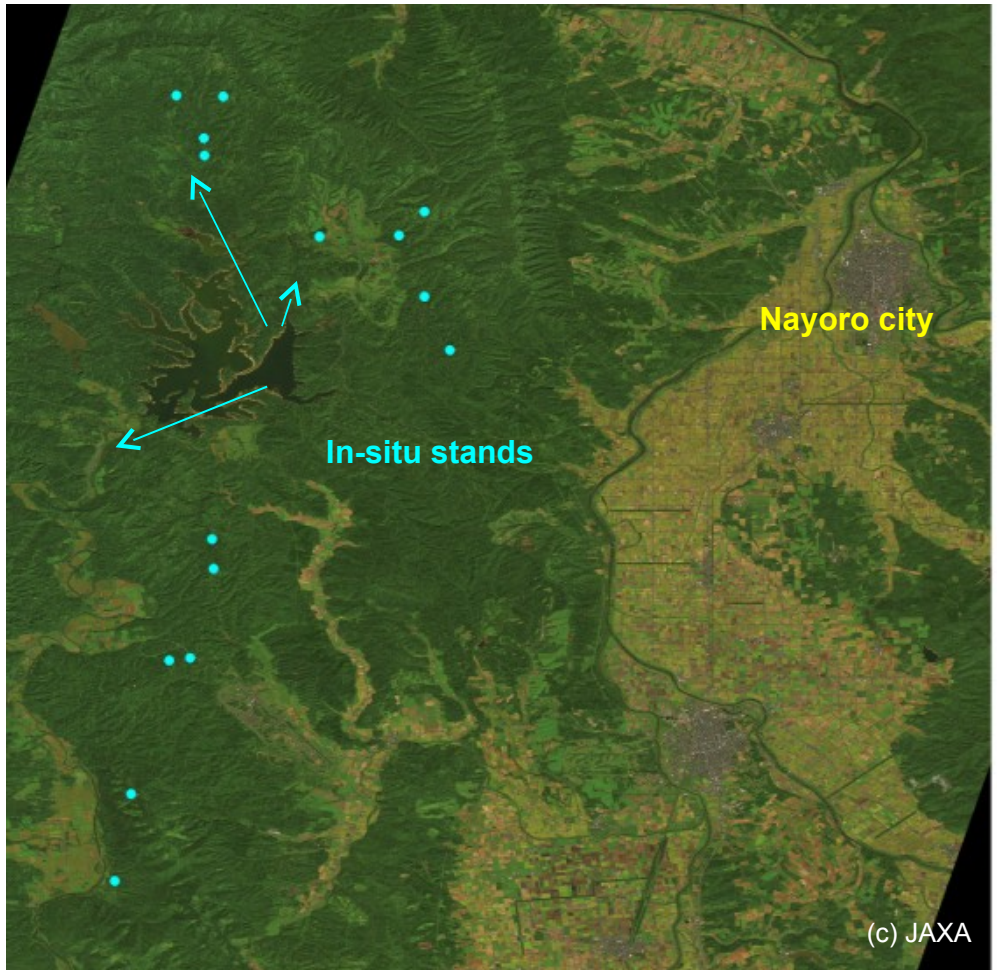
- In-situ tree census data are provided by Hokkaido University (Dr. Yoshida, Dr. Shibata, and their members).

ALOS PRISM

Digital canopy height model
Vs. biomass

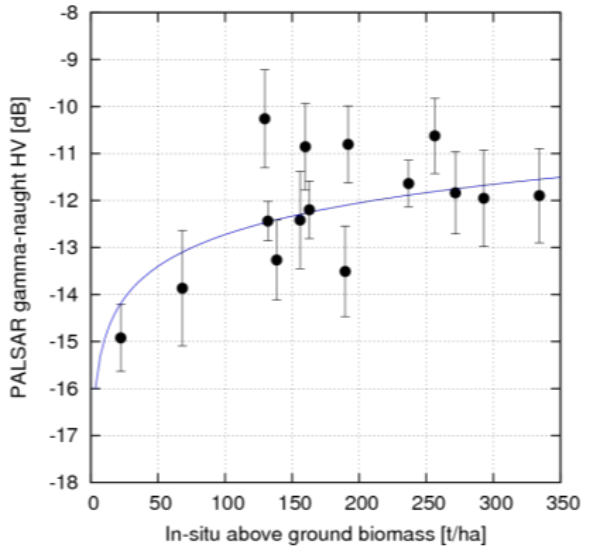


ALOS PRISM/AVNIR-2, 2010/09/09



ALOS PALSAR

Backscattering coefficient
vs. biomass



“Monitoring Site 1000” in Japan

by the Ministry of Environment of Japan (2003-)

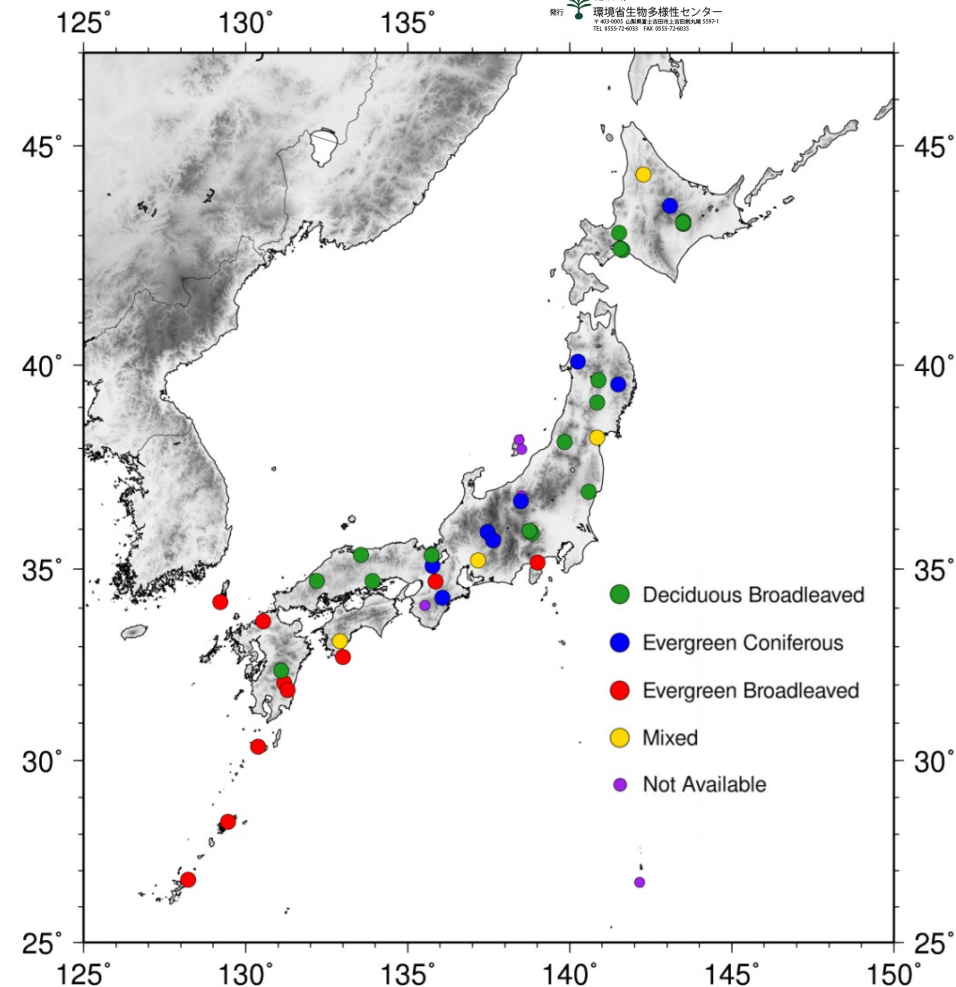
- so called “monisen”
- Network of long-term research sites for biodiversity assessment
- collaborating with JaLTER
- Tree census ... 49 sites
- Located at various forest types



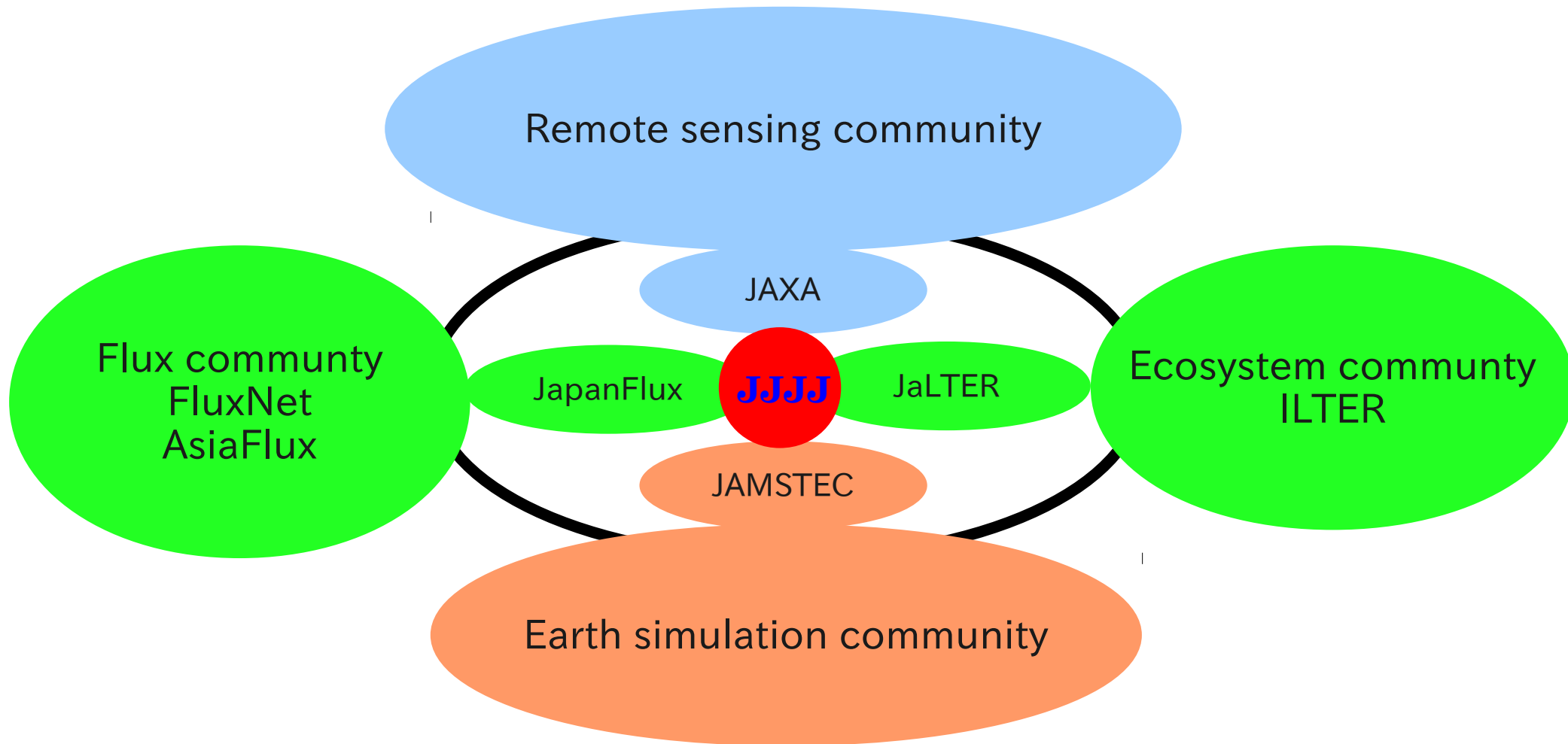
Website: <http://www.biodic.go.jp/moni1000/>



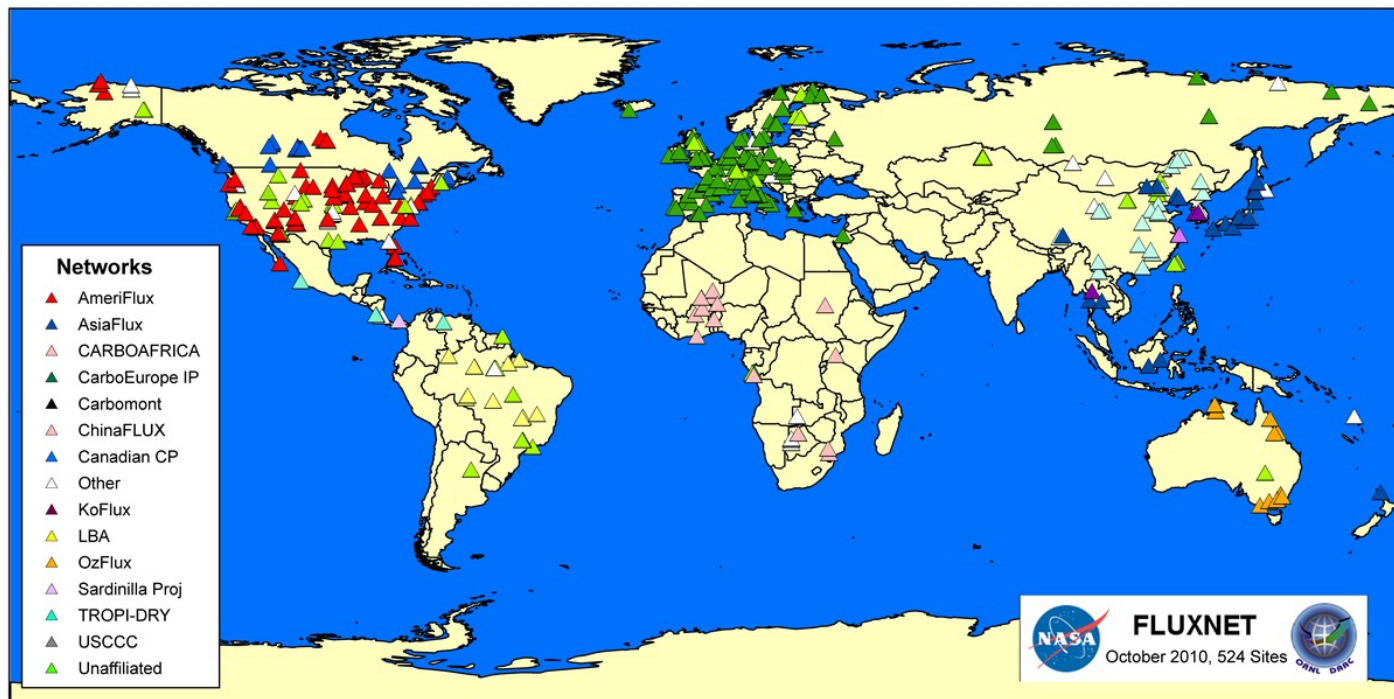
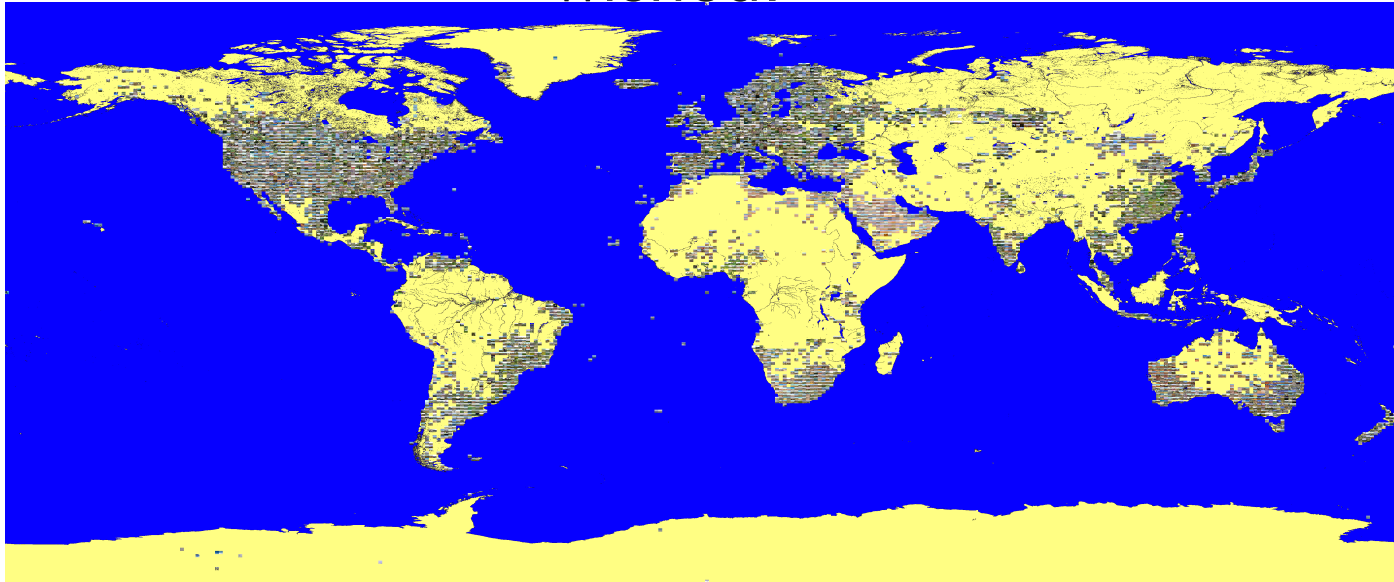
In situ Biomass Data



JJJJ-Community ... a collaboration group of JAXA, JaLTER, JapanFlux, and JAMSTEC.



Ground information of Africa is needed, required, hoped, and wished!



Conclusion

- Let's become happy by sharing and connecting each other. Less politics.
- Let's make more “good practices” than “standard protocols.”
- Let's make use of mobile gadgets (smart phone, GPS video coder, etc.)
- Let's repeat visiting to same points --> temporal change.
- Let's “rescue” numerous photos taken by amateur people.
 - * Give geolocation & time stamp to each photo
 - * Digitize (scan) and store.
 - * Visit again and again. --> historical change.
- Copyright issue. Creative Commons? ODbL?
- Let's collaborate with existing scientific ground networks.

Land cover WS in Tokyo, supported by JAXA (May 25, 2012)