Geo-Wiki.org: Harnessing the power of volunteers, the internet and Google Earth to collect and validate global spatial information

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Abstract

Land cover derived from remotely sensed products is an important input to a number of different global, regional and national scale applications including resource assessments and economic land use models. During the last decade three global land cover datasets have been created, i.e. the GLC-2000, MODIS and GlobCover, but comparison studies have shown that there are large spatial discrepancies between these three products. One of the reasons for these discrepancies is the lack of sufficient in-situ data for the development of these products. To address this issue, a crowdsourcing tool called Geo-Wiki has been developed. Geo-Wiki has two main aims: to increase the amount of in-situ land cover data available for training, calibration and validation, and to create a hybrid global land cover map that provides more accurate land cover information than any current individual product. This poster gives an overview of the main functionality of Geo-Wiki along with the current usage statistics and the lessons learned to date. Furthermore, Geo-Wiki branches are described, along with related mobile phone applications.

Overview of Geo-Wiki

The Geo-Wiki Project is a global network of volunteers who wish to help improve the quality of different thematic datasets globally. Since large differences occur between existing datasets, current ecosystem and land-use science lacks crucial accurate data. Volunteers are asked to review hotspot maps of global data disagreement and determine, if the datasets are correct or incorrect based on what they actually see on Google Earth and their local knowledge. Their input is recorded in a database, along with uploaded photos, to be used in the future for the creation of a new and improved hybrid products.

The design of Geo-Wiki follows that of a standards-based geospatial portal as outlined by the Open Geospatial Consortium, with portal, portrayal, data and catalog services. Geo-Wiki consists of a number of components and technologies including: a web portal (using PHP and an Apache web server with Gentoo Linux); a client (using Javascript, Google Earth API, WMS client); a database (PostGIS); and the OGC Web Map and Web Feature Service.

Geo-Wiki User Interface
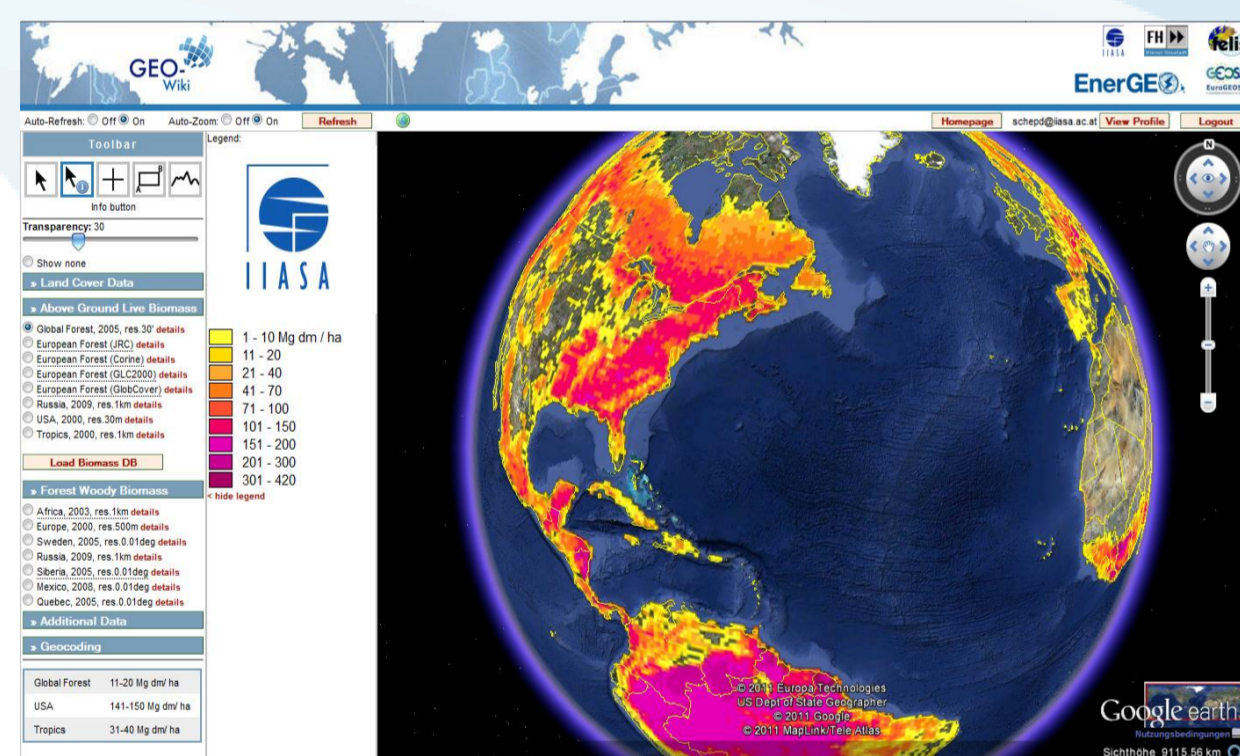
Google Earth is displayed with functionality to rotate the Earth and to zoom into any land surface to begin land cover assessment. The user can also plot any of the global land cover maps (GLC-2000, MODIS, GlobCover) on top of Google Earth, or the user can display the disagreement maps between any pair of land cover products . It is these large areas of disagreement that Geo-Wiki is targeting in its crowdsourcing efforts.

Assessing land cover

There are different ways in which the user can assess land cover.: (1) Validate random points and (2) define a validation area. The latter methods allows the user to define an area via either drawing a custom shape in Google Maps by defining the vertices of the polygon and then saving it. Or uploading a kml file containing a polygon. Within this validation area the user can then define specific validation steps (e.g. km, mi or °) or can validate based on a random sample of a predefined number of validation points. Once defined, a custom area can be shared with other users to collaborate in completing the sample.
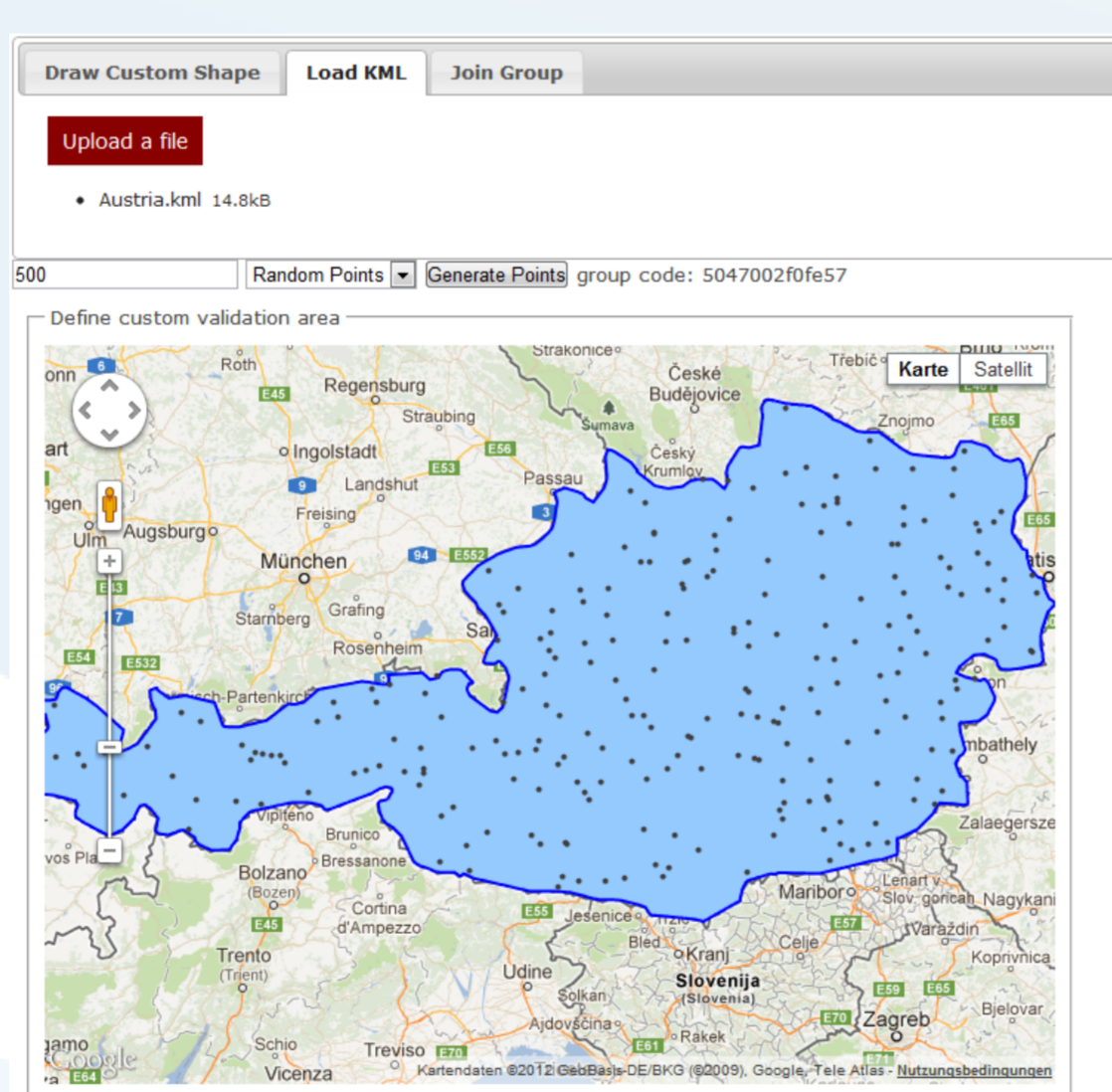

Geo-Wiki Branches

- **AGRICULTURE.Geo-Wiki.org:** Users are asked to determine the percentage of agricultural area that can be seen in a MODIS-sized pixel using Google Earth. In addition to the global land cover products GLC-2000, MODIS v.5 and GlobCover 2005, different global and regional agricultural datasets can be viewed.

- **BIOMASS.Geo-Wiki.org:** A collection of global, regional and in-situ biomass datasets designed for comparative analysis and validation.

- **HUMANIMPACT.Geo-Wiki.org:** Users are asked to determine the degree of human impact and agricultural intensity that is visible in a defined area using Google Earth. Additionally users are asked to provide the land cover type and the level of abandonment.

- **REGIONAL.Geo-Wiki.org:** A set of landcover products for Russia including carbon budget parameters.

- **URBAN.Geo-Wiki.org:** Users are asked to determine the percentage of urban area that can be seen in a MODIS-sized pixel using Google Earth. Urban areas can be viewed for the GLC-2000, MODIS v.5 and GlobCover 2005. Disagreement maps between each pair of land cover products can also be displayed..

COMPETITION.Geo-Wiki.org:

Owing to the large amount of disagreement among global land cover products, the creation of a global hybrid land cover product is seen as a major step towards improvement. In that regard, the goal of this competition is to focus on the areas of greatest disagreement among the existing products.

First Results:

The human impact competition was initiated in September 2011. More than 60 people took part in the competition with approximately 55,000 points validated in total.
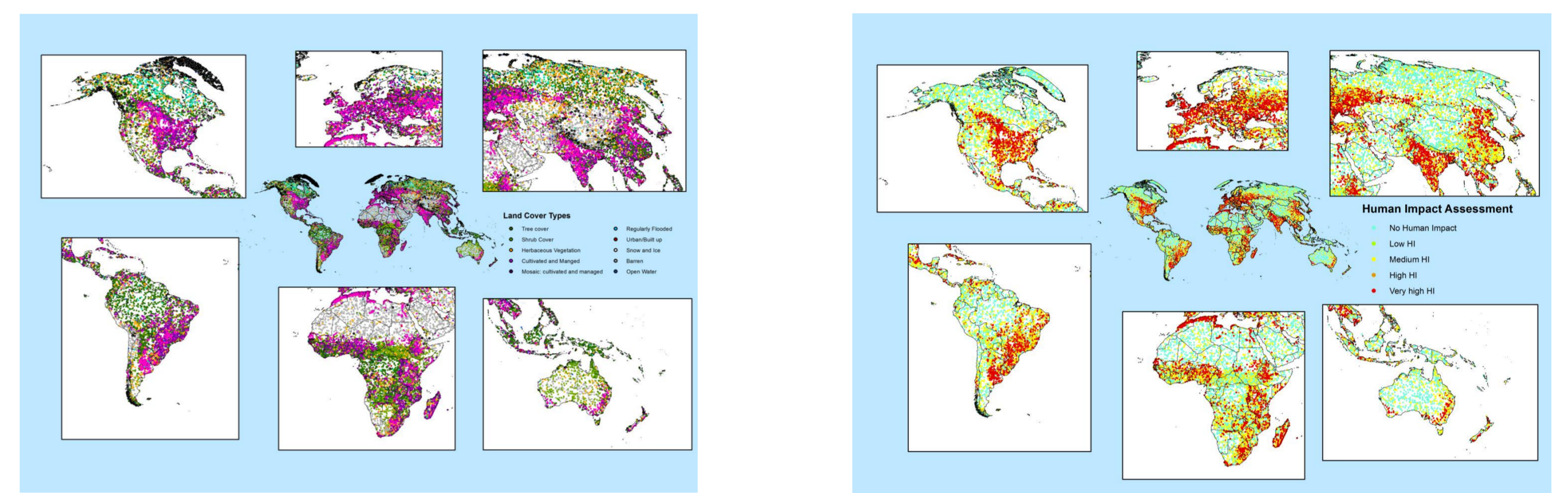

Lessons learned:

Although the campaign was a success with such a large number of points collected over a two month period, a number of issues arose during the competition, which are being used to improve Geo-Wiki. These include:

1) In the human impact competition we asked users to classify the land cover based on the dominant land cover type. We have now added the ability to indicate how many land cover types there are in an area based on the percentage of occurrence. A grid is overlaid onto the area to help users determine these percentages.

2) The addition of other information from external sources such as flickr, picasa, youtube and twitter to help in making interpretations, particularly with low resolution imagery.

3) The provision of social networking tools embedded directly within Geo-Wiki so that users can interact, discuss areas that are hard to classify and ask the Geo-Wiki team any questions during the competition.

Geo-Wiki Mobile

The world of Geo-Wiki in your hands. Geo-Wiki mobile allows users to upload geo-referenced pictures and add important land cover information.

With Geo-Wiki mobile users can photograph landscapes and share them with their friends and colleagues through Geo-Wiki.org, using the visualization capacity of Google Earth. Users photographs will be automatically geo-referenced and tagged with information such as compass direction and the angle of tilt.
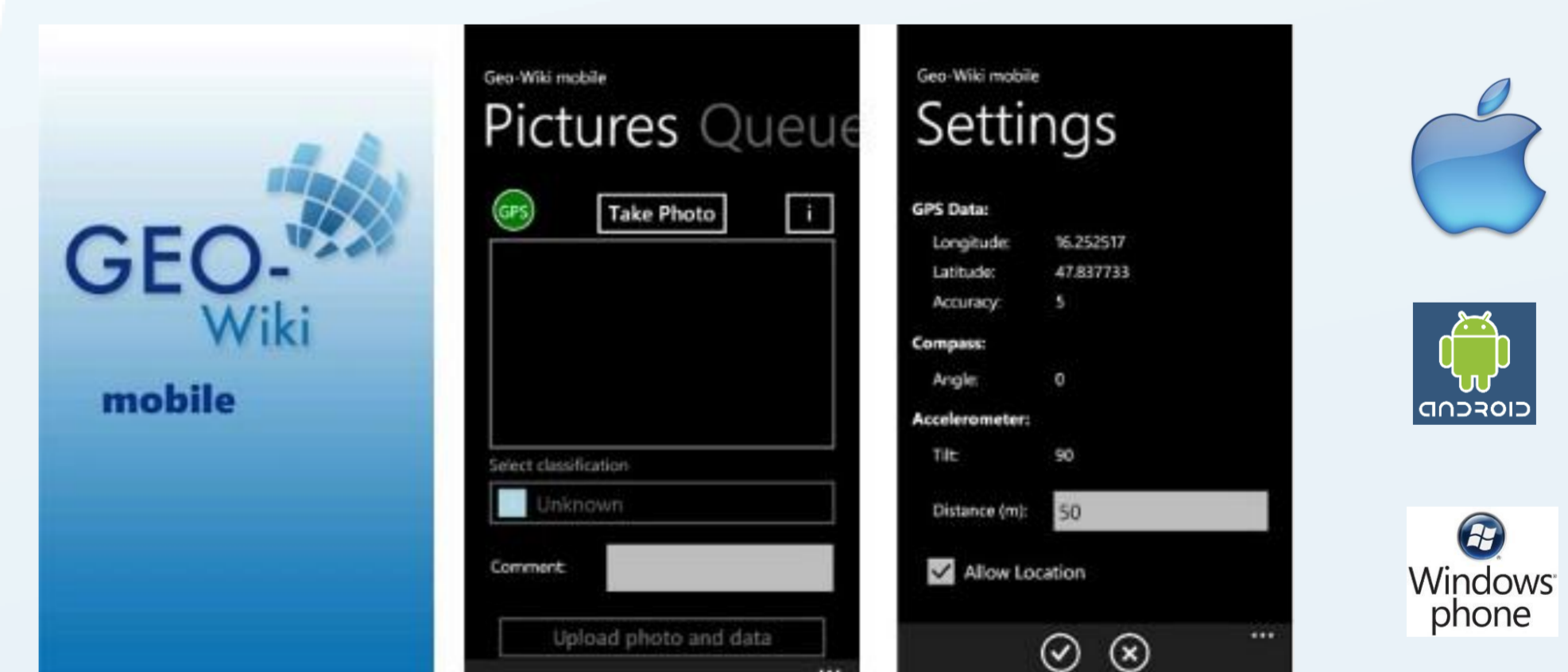
Features:

1) Take photographs of landscapes while on holiday or while out with your friends, which automatically provides a geographic coordinate, the compass direction and the angle of tilt.

2) Tag the photographs with text that you want to share with your friends.

3) Tag the photographs with a land cover type based on a simple to use drop down menu. These land cover types are used to help us validate global land cover maps.

4) Upload these photos to Geo-Wiki.org, a site that allows you to visualize your photographs on Google Earth. The images can be uploaded via mobile connection or stored until you have Wi-Fi access.
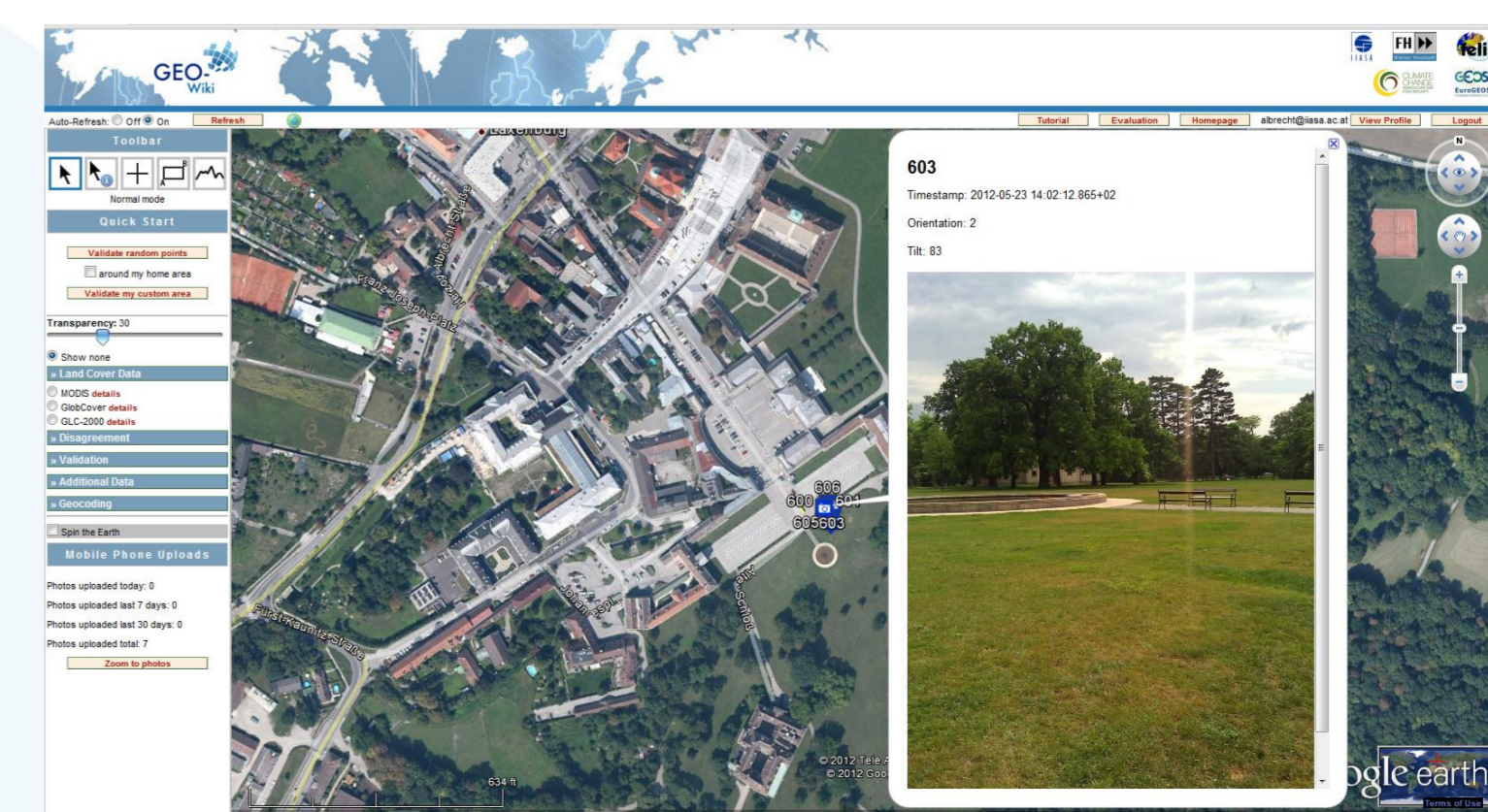
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