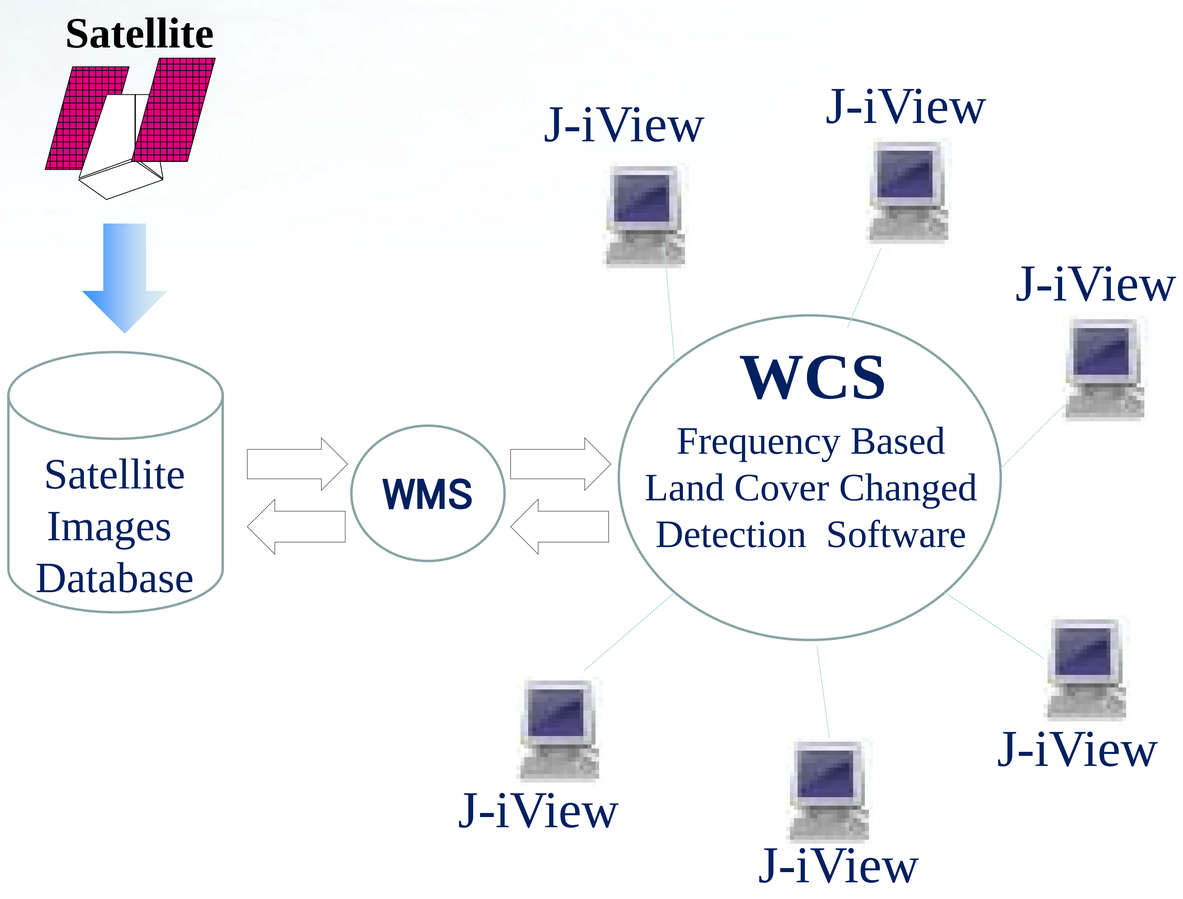
Web Computing Service (WCS) for detecting land cover change caused by volcanic eruptions using Web Map Service (WMS), frequency based change detection algorithm and PALSAR

Joel Bandibas, Daisaku Kawabata, Minoru Urai , Asep Saepuloh and Koji Wakita
Geological Survey of Japan, AIST

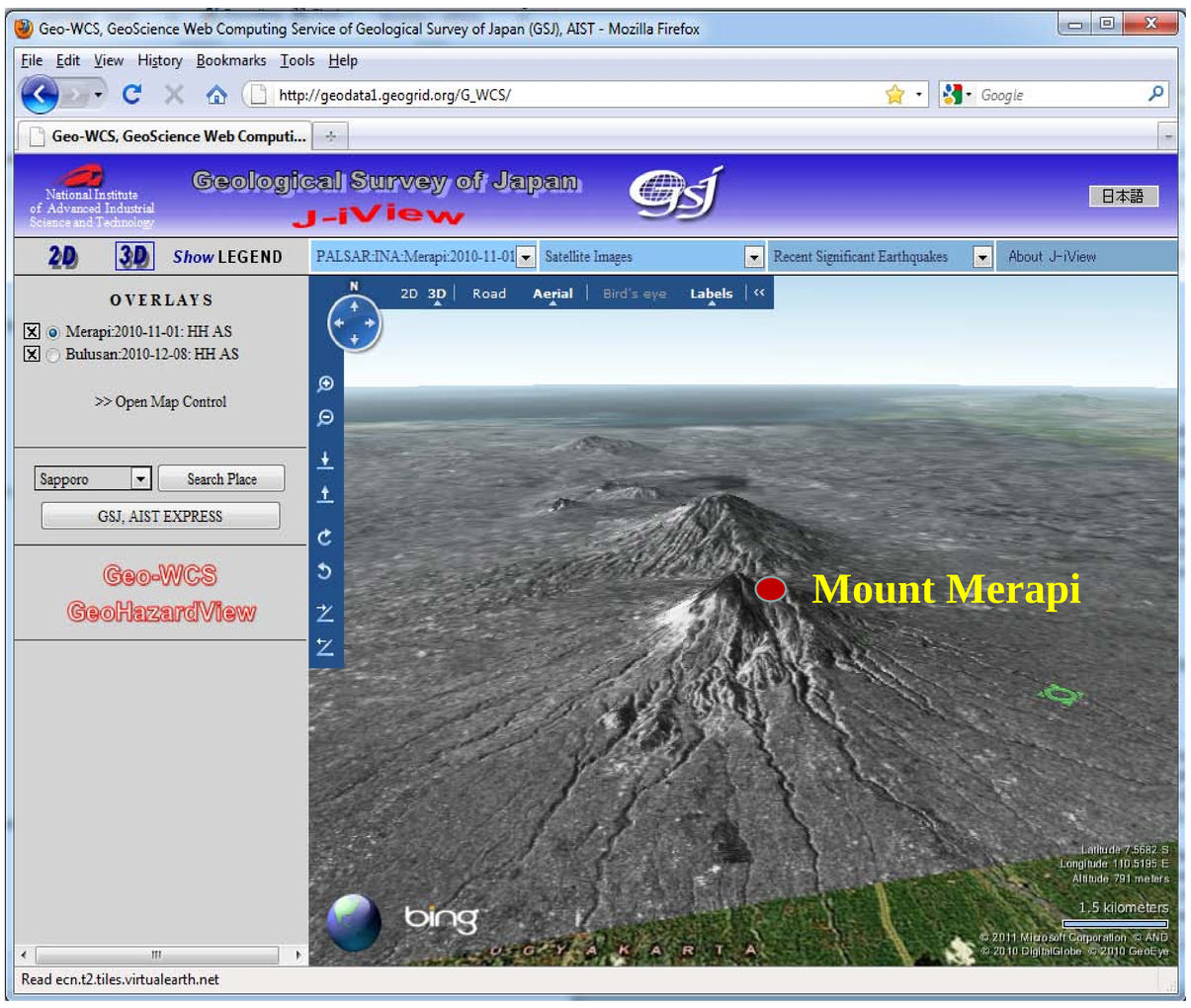
Introduction

This research focuses on the development of a cost effective and efficient system of identifying areas affected by volcanic eruptions, and the efficient distribution of the information. The developed system is composed of 3 modules which are the Web Map Service (WMS), Web Computing Service (WCS) and the user interface provided by J-iView, the online mapping system developed at the Geological Survey of Japan. WMS is a standard protocol that provides a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases. WCS is an online system that provides computation, storage and data access services. In this study, the WCS module provides online access of the software implementing the developed algorithm for land cover change detection. It also sends requests to WMS servers to get the remotely sensed data which are used as inputs for change detection computation. PALSAR images covering Merapi volcano taken before and after its October 2010 eruptions were used in this study. The developed sytem successfully generated a map showing the areas affected by the 2010 eruptions of the volcano.

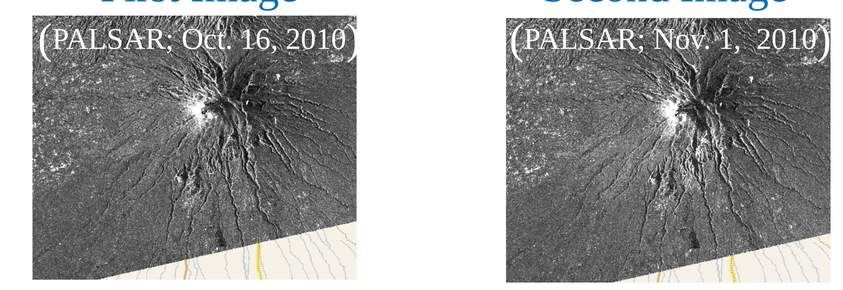
Web Computing Service (WCS) for detecting land cover change



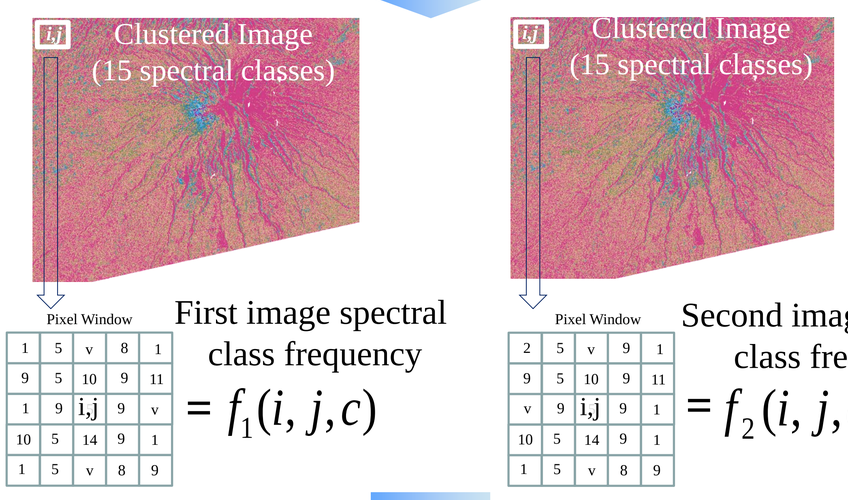
J-iView showing PALSAR image(HH As) of Merapi volcano on November 1, 2010



Land cover change detection algorithm



Moving Averages Clustering

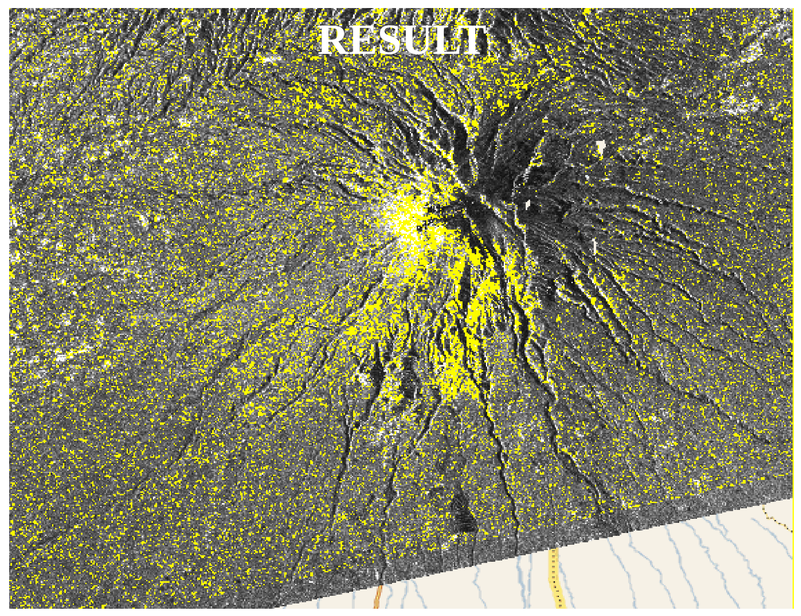


Spectral class frequency ***f(i,j,c)*** is the number of times spectral class *c* (labeled from *1* to *v*) occurs in the window centered at ***(i,j)***.

Change is detected by determining the distance $d_{(i,j)}$ between the two spectral class frequencies.

$$d_{(i,j)} = \sqrt{\sum_{c=1}^{v} (f_1(i, j, c) - f_2(i, j, c))^2}$$

If $d_{(i,j)}$ is greater than the set threshold, the pixel at location ***(i,j)*** has changed.



Areas covered by volcanic ash or pyroclastic flow.