European Space Agency
2014 Conference on Big Data from Space
**BiDs'14 Data Visualization and Analytics**

Our need to address **Big Data** comes from the **Big Space** we've been steeped in for some 14 or so billion years. There's a lot here, so it would be nice to have the tools to better appreciate it.



European Southern Observatory (ESO), Cerro Paranal, Chile

This session, Data Visualization and Analytics, is about [Heterogeneous Missions Accessibility](), HMA, and the importance of this ESA initiative. With the presentations today, we will demonstrate how NASA World Wind supports this Big Data initiative. But first I would like to address the urgency of the 'Big Data' Heterogeneous Missions Accessibility task and propose how we might achieve even greater Heterogeneous Mission Accessibility.

Does anyone not know about this book, Heterogeneous Missions Accessibility? The first 50 pages and the Concluding Remarks on the last page, should be required reading for all GIS professionals. It is the definitive recipe, the methodology, for cooking up big data, essentially how to make it accessible. And, this book is one of the most pleasant 'straight talk' technical reads I have ever encountered. You can purchase your own copy for €30 Euros, but it is also freely available online. HMA is the definitive guide for developing tools to access big EO data.

Earth Observation (EO) and the tools for that, are essential to our self-discovery. To maximize intelligence of that data we must maximize the **exchange** of ideas within the scientific community as well as increase the public dialogue sharing that big data. Visualization and analytics are only one step in achieving that big data **exchange**, a step that would benefit if we took it together!

To see big EO data translated into human impact, there's an article in the Science journal, September of last year, and it is also available free online. The article is titled 'Quantifying the Influence of Climate on Human Conflict.' This article shows a disturbing trend in human behavior given recent shifts in local weather patterns as well as over the past few millennia. I urge you to look at this study: http://www.sciencemag.org/content/341/6151/1235367.

Today you will see a few virtual globe programs that are exemplary of Heterogeneous Mission Accessibility. I should add that ESA was an early adopter of NASA World Wind open source technology, beginning in 2006 led by Dr. Pier Giorgio Marchetti. We can still see the fruits of that today, http://earth.esa.int/EOLi/EOLi.html. EOLI uses the Java version of World Wind. That work began back in the heyday of Java, having the slogan of 'write once run anywhere.' Today's mobile devices have returned us to the platform wars of yore. World Wind has had to follow suit with versions in Java, Android and iOS. So, here is the proposal and the challenge. Next month we will begin development of the web browser version of NASA World Wind in HTML5. We invite qualified members of this 'Big Data' community to embed on our team, an appropriately qualified developer who can participate in assuring 'their' visualization and analytics needs are met with this HTML5 version of World Wind. This is a virtual team, so there is no need to move, just apply. Feel free to contact me at Patrick.Hogan@nasa.gov.

For our presentations today, first will be Prof Maria Brovelli of Politecnico di Milano at Como who will share some very sophisticated visualization techniques for working with 'big data' in terms of dynamic voxels, or doxels, *Environment Space and Time Web Analyzer (EST-WA)*.
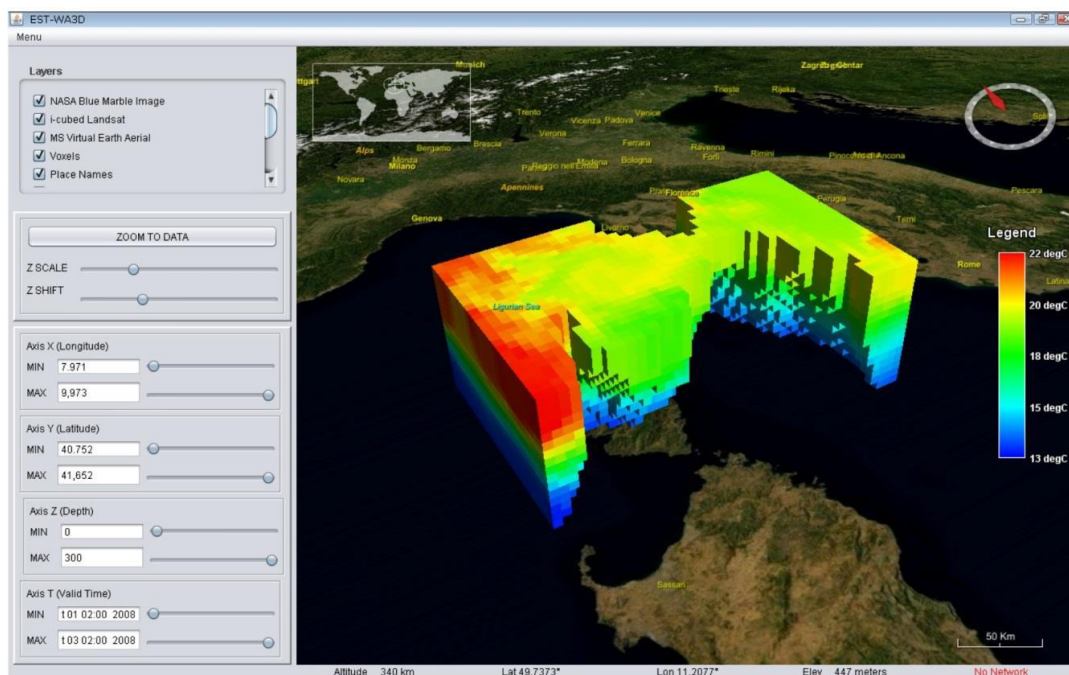
Next will be Prof Varun Chandola of Buffalo University, New York, New York, USA who will demonstrate *iGlobe*. iGlobe began as a technique for optimizing accessibility to NetCDF data and has become an interactive visualization and analysis system for integrating EO with other geospatial data sets, such as environmental and demographic data.
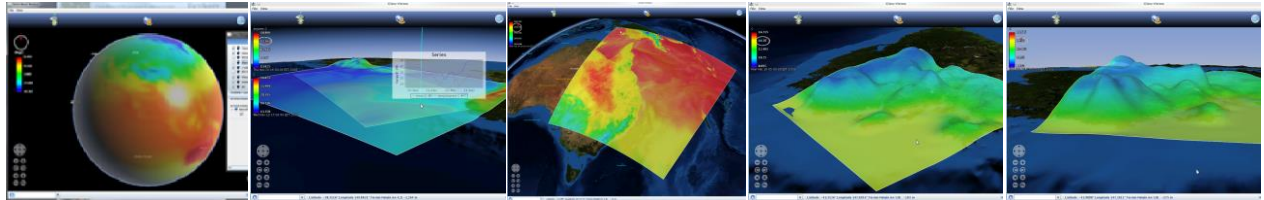


Thirdly will be Keith Cressman and Dr. Giuseppe Conti for the *eLocust3D*, another World Wind app, but on the Android platform. Keith is the UN/FAO Program Manager for their Locust Watch enterprise. Keith actually began his international career with the Peace Corp, 33 years ago. Dr. Giuseppe Conti is the CTO of Trilogis, serving greater Europe with offices in Italy and Brussels and he generously initiated the development of eLocust3D. Trilogis, who are also leading the Location Based Services activities for the EU, have provided, pro-bono, this UN flagship application for managing the very serious environmental threat of locusts to agriculture throughout northern Africa and the Middle East.
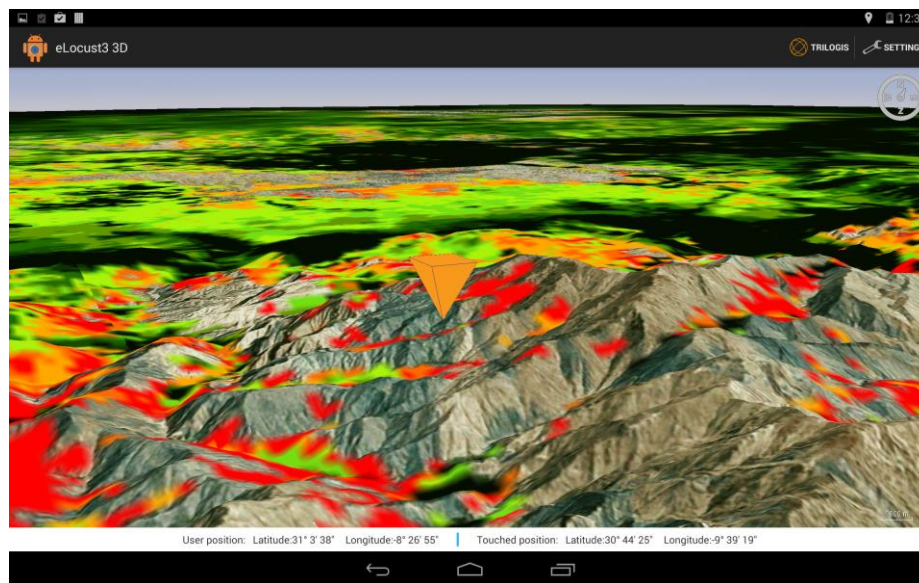


Lastly we will present the first implementation of a *Global Earthquake Forecast System* that involves coordinating continuous analysis of satellite data with ground monitoring station data to corroborate earthquake precursor signals. Though these techniques have been proven using historical data, this is the first implementation of a system for live analysis of this data to provide an early warning system. This methodology is central to a €5MM Horizon2020 proposal led by Trilogis, Prof Gaetano Ranieri and Dr. Lucca Piroddi of University di Cagliari, Italy. The State of Alaska, as part of their Secondary Education system guided by TrilliumLearning.com, has already installed four (4) of the earthquake precursor monitoring stations built by Intelesense.net.