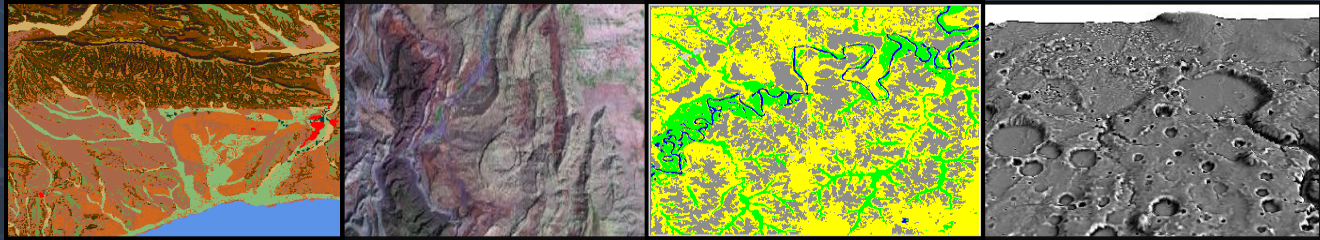




INFORMATION SYSTEMS LLC
a U.S. company

Route To A Remote Sensing Geology Career



Today's Agenda:

- *My Route*
- *Potential Employers & Skills*
- *Trends Going Forward*
- *Take-Away Messages*

GRSG - September 10, 2014

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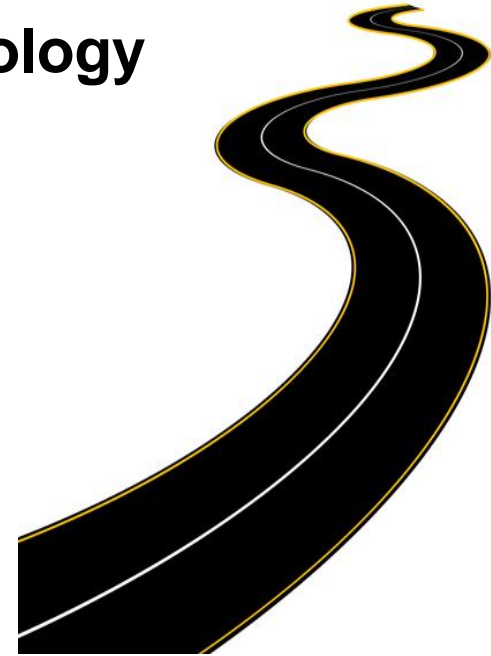
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My Route:

- **BS Geology/AAS Civil Engineering Technology**
 - Geomorphology Research Assistant
- **Geotechnical Engineering Firm**
- **MA Geology**
 - Thesis: Electrical geophysics and fluid flow
- **Shell Oil Company**
- **Environmental Consulting Companies**



EarthSat/MDA

Remote Sensing Geologist/Manager
oil/environmental/gov't/mining/water

Who Hires Geologists With Remote Sensing Skills?

- Geospatial companies (services/products)
- Government agencies and contractors
 - Natural resources; defense
- Academia
- Environmental firms/organizations
- Oil companies
- Mining companies
- Engineering/Water companies

Geologic Consulting RS Projects

- Petroleum Exploration
- Water Exploration/ Management
- Mining Exploration
- Environmental and/or Government

Oil Seeps and Spills

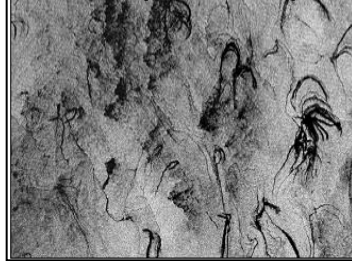
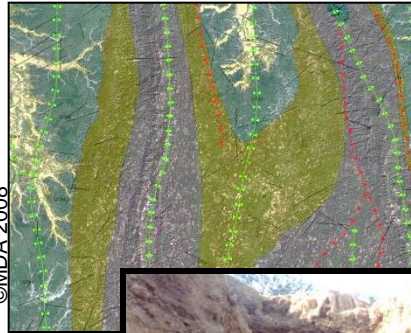


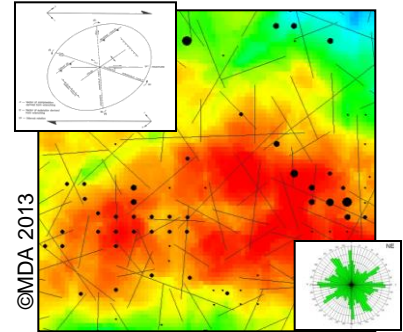
Image: RADARSAT-1 data © CSA 2011 Received by the Canada Centre for Remote Sensing. Processed and distributed by MDA Geospatial Services Inc.

Lithology and Structures



©MDA 2008

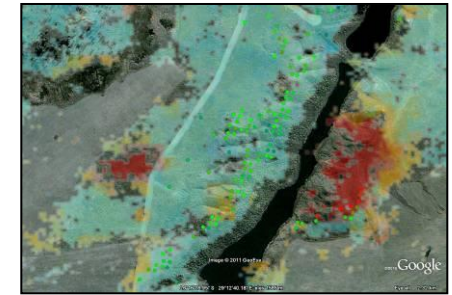
Lineament Analysis



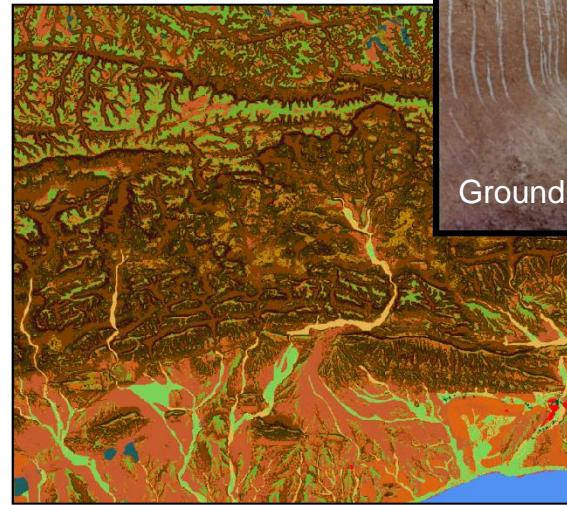
©MDA 2013



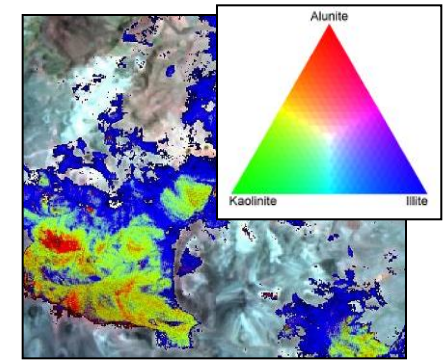
Ground Truth



Ground Deformation from RADAR (InSAR) ©MDA 2012



Modelled Soil Texture
Terrain Analysis and Land Cover Mapping
©MDA 2012



Mineral Alteration Mapping
ASTER Imagery

Skill Set For Remote Sensing Projects



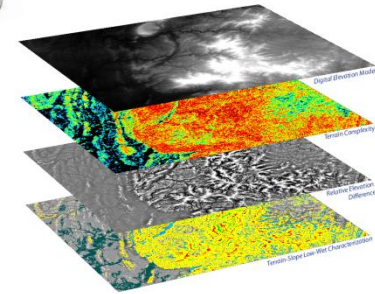
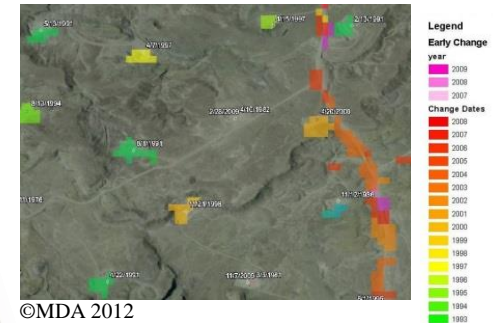
Skill Set For RS Projects	Have a Good Understanding Of:	Take Geomorphology, Field Geology, And:	Other Courses To Take Or Topics To Read Up On:
Petroleum Exploration	<ul style="list-style-type: none"> -Hydrocarbon migration and trapping mechanisms -Geomorphic expressions of structure 	<ul style="list-style-type: none"> -Structural geology -Historical geology -Geophysics 	<ul style="list-style-type: none"> -Offshore oil seeps -The geochemistry behind geomorphic/mineral alteration indications of microseepage
Water Exploration/ Management	<ul style="list-style-type: none"> -Fluid flow and storage -Sustainability 	<ul style="list-style-type: none"> -Hydrogeology -Hydrology -Geochemistry 	<ul style="list-style-type: none"> -Sedimentology -Geophysics -Civil engineering topics
Mining Exploration	<ul style="list-style-type: none"> -Mineralization models -Fluid flow 	<ul style="list-style-type: none"> -Mineralogy/Petrology -Geochemistry -Geophysics 	<ul style="list-style-type: none"> -Historical geology -Case histories -Structural geology -Civil engineering topics
Environmental and/or Government	<ul style="list-style-type: none"> -Various reasons for projects -Geologic/Terrain/Vegetation implications and interactions 	<ul style="list-style-type: none"> -Geochemistry -Forestry, Ecology and/or Agronomy 	<ul style="list-style-type: none"> Marine processes/ocean color -Climate/Meteorology -Civil Engineering topics

Trends Going Forward



Then (1997)

- Few players; nearly brand-new industry
- Negatives, hardcopies and light tables ruled
- Each Landsat image cost \$3,000



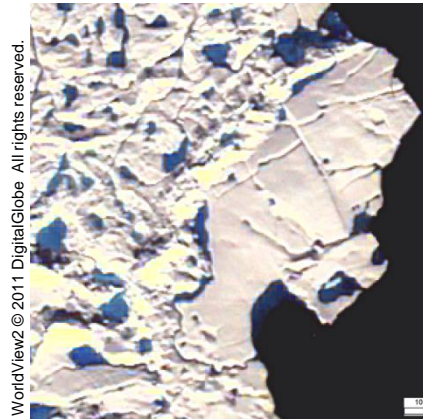
Now (2014)

- Many more players but still lots to do
- It's a digital world
- Stacks of imagery – Landsat is now free!

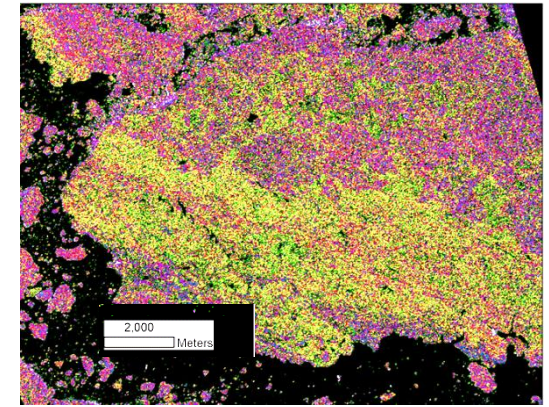
Trends Going Forward



Stereoscope with prints of Landsat and declassified Corona imagery on light table



WorldView2 © 2011 DigitalGlobe All rights reserved.



RADARSAT-2 Data and Products © 2011 MDA. All rights reserved

To research characterization methods for ice floe textures, multiple types of imagery were synchronously acquired while a research vessel obtained ground truth photos. Left: Image from a stereopair of DigitalGlobe WorldView 2 imagery Right: Wishart classification of QuadPol RADARSAT More information: Brunke et al - IGARSS, 2014.

Then

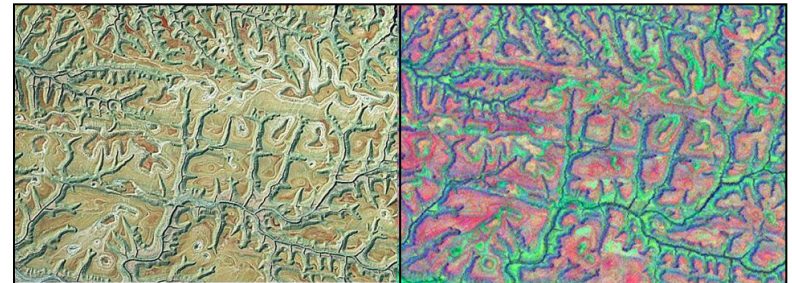
- Rare Digital Elevation Models (DEMs)
- No commercial high-resolution satellites
- GPS challenging to use
- Limited satellite RADAR options

Now

- Multiple Global DEMs – different sensors, scales and dates
- Many options for higher spatial, spectral, & temporal resolutions
- GPS easy and widely available
- Multiple RADAR band and polarity choices

Take Away Messages

- Big picture
 - Develop your geologic skills and stay flexible
 - Remote sensing and GIS are great tools!
- Day-to-day
 - Use the right imagery and processing for the job
 - Know your data sets' benefits and limitations
 - Don't forget RADAR and thermal!
 - Maintain your passion and creativity



Left: Landsat GeoCover 2000 – Natural color processing

Right: Same data after selective masking and MNF processing

Questions?