

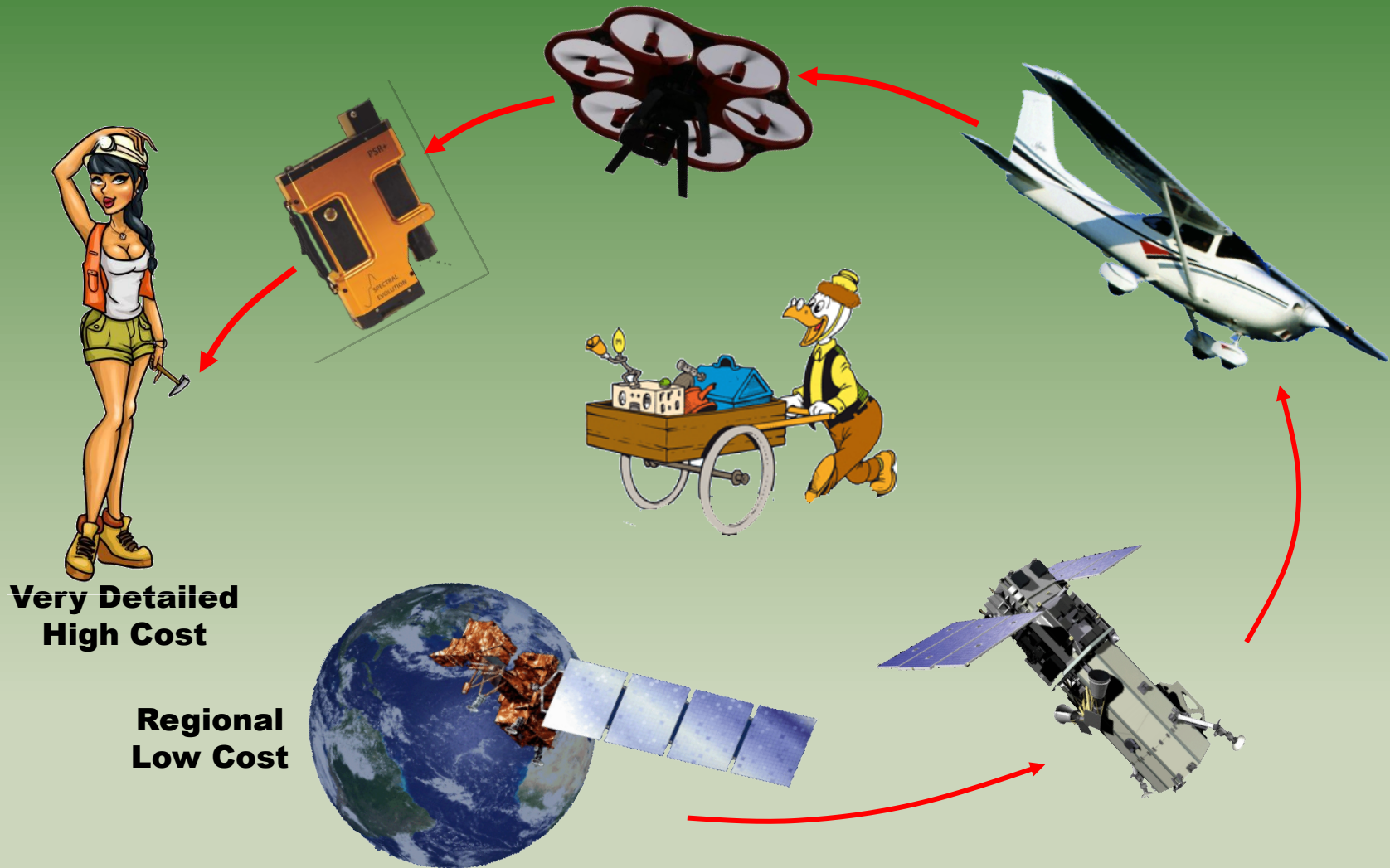
INFRARED SPECTROSCOPY: FROM SPACE TO FIELD



KNGMG "Fieldwork from Space" symposium
Jan.20, 2017, Space Expo, Noordwijk

REMOTE SENSING TOOLS

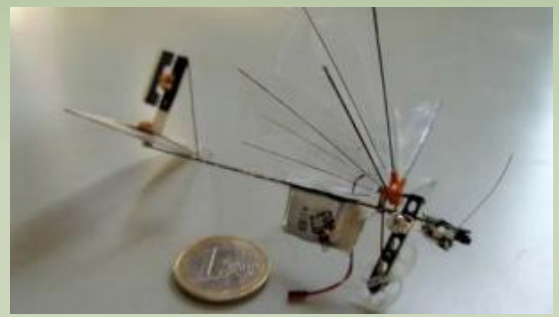
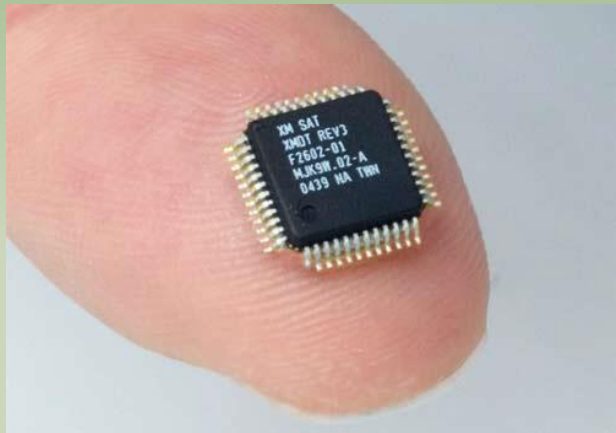
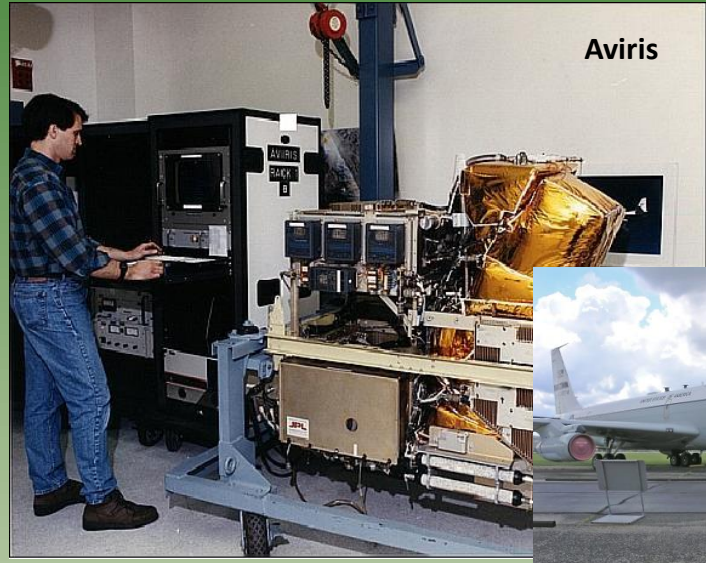
Balance between **DETAIL** of information and **COST** of acquisition



REMOTE SENSING: HUGE ADVANTAGES



Amazing technological innovation within 30 years



EXTREMELY HIGH DETAIL & QUALITY



WV2 Pansharpened 50cm



Airborne Hyperspectral 50cm



Smartplanes UAV 5cm



Landsat 4, 30m, 1983



WHAT MINERALS CAN BE IDENTIFIED

PHYLLOSILICATES, CLAYS, CHLORITES, SERPENTINE

HYDROXYLATED SILICATES (E.G. EPIDOTE, AMPHIBOLE)

SILICA VARIETIES

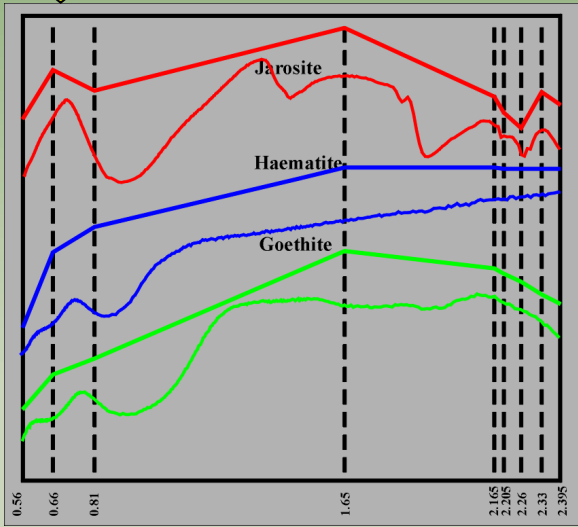
SULPHATES AND CARBONATES

CRYSTALLINITY VARIATIONS

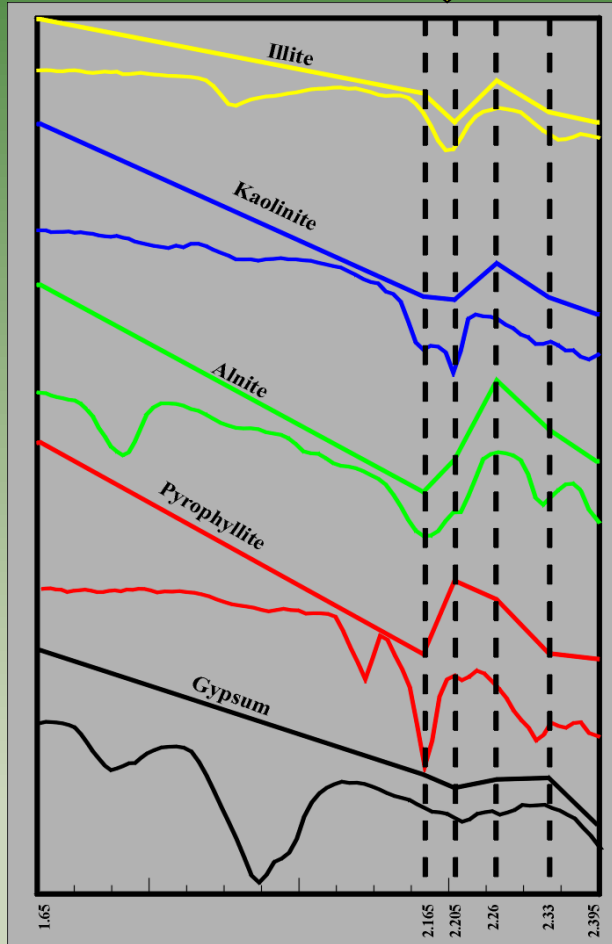
COMPOSITIONAL VARIATIONS



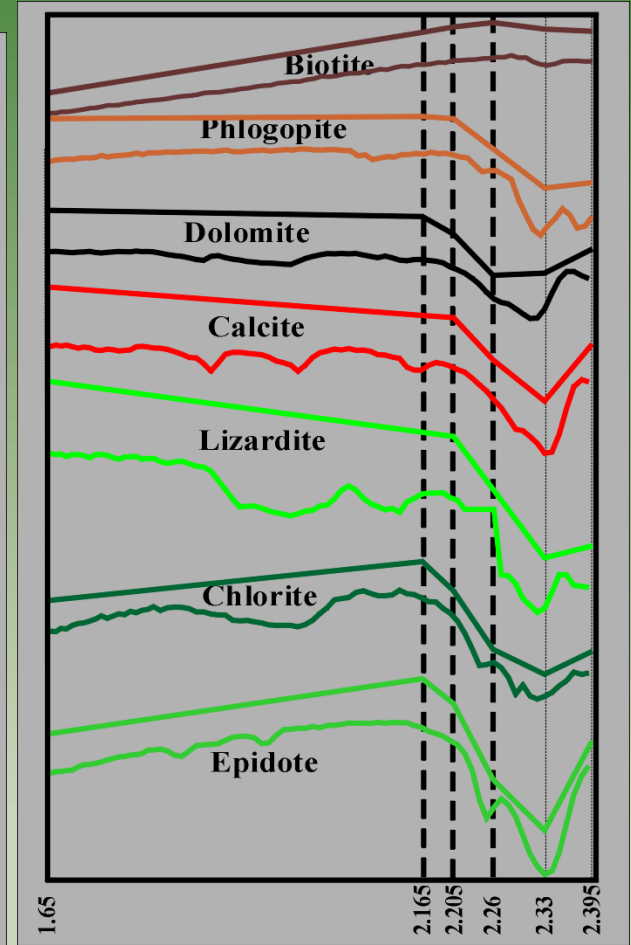
ABSORPTION FEATURES IN VNIR AND SWIR



Category 1



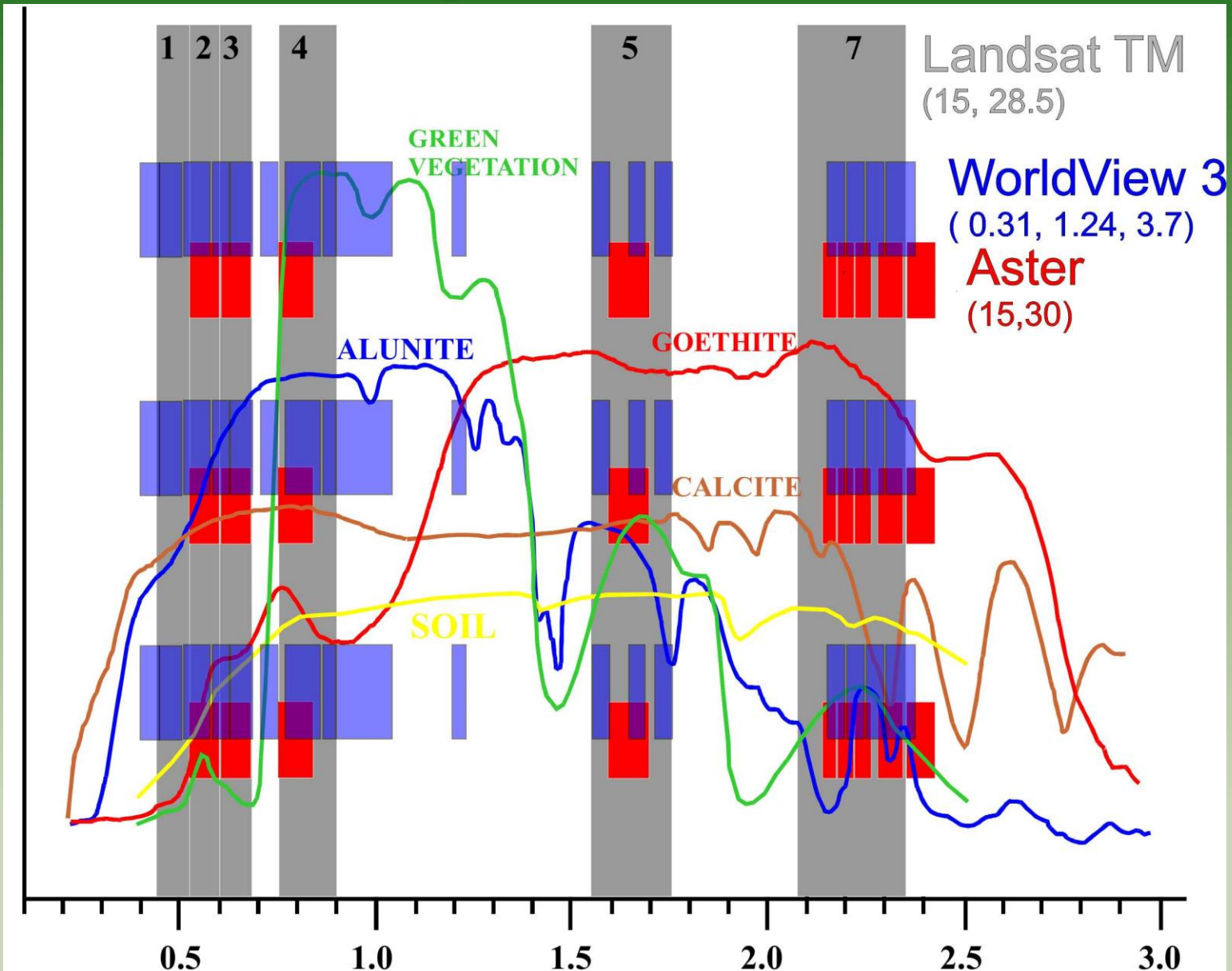
Category 2



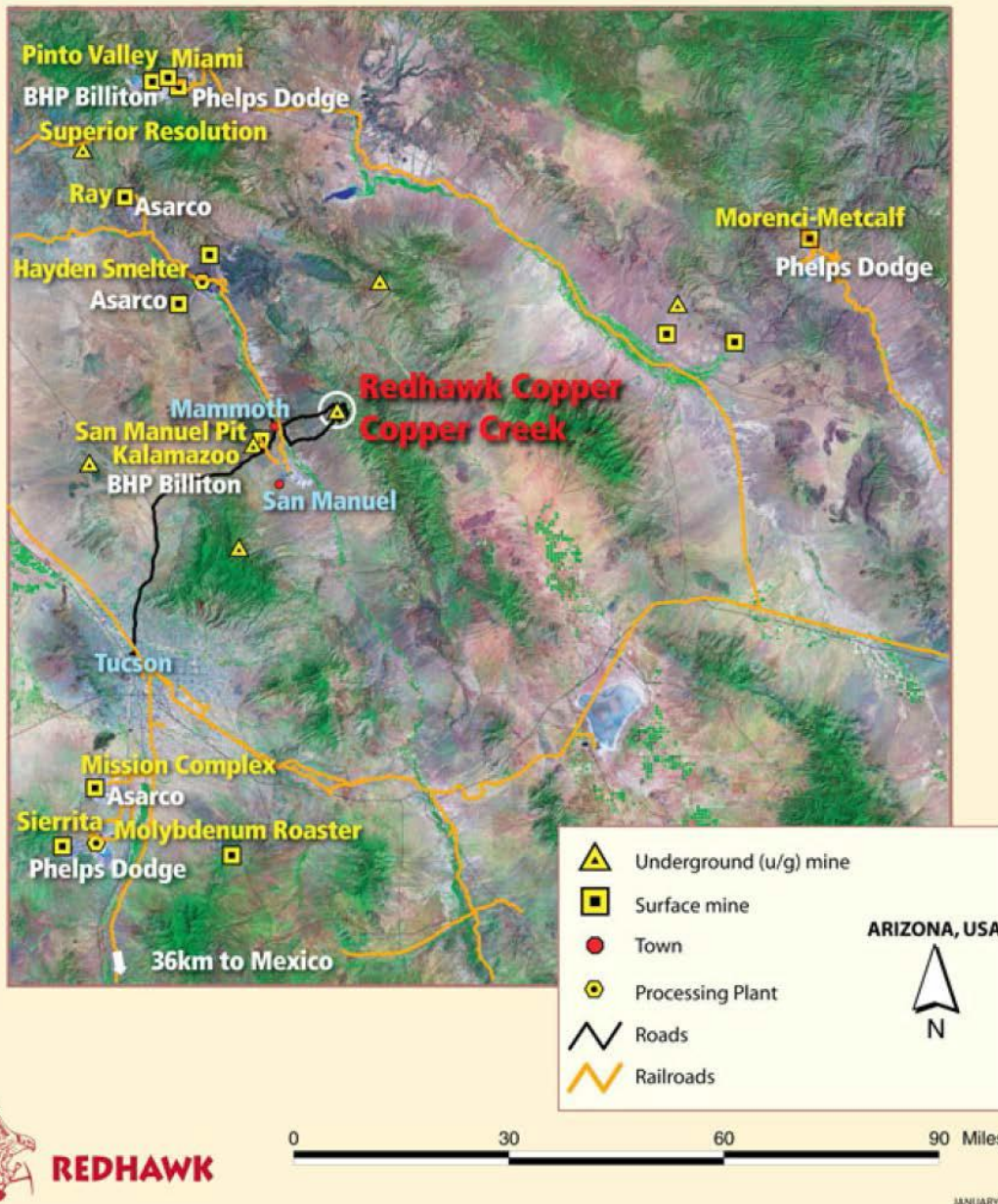
Category 3



Most important satellites



Mineral exploration: Alteration Mapping



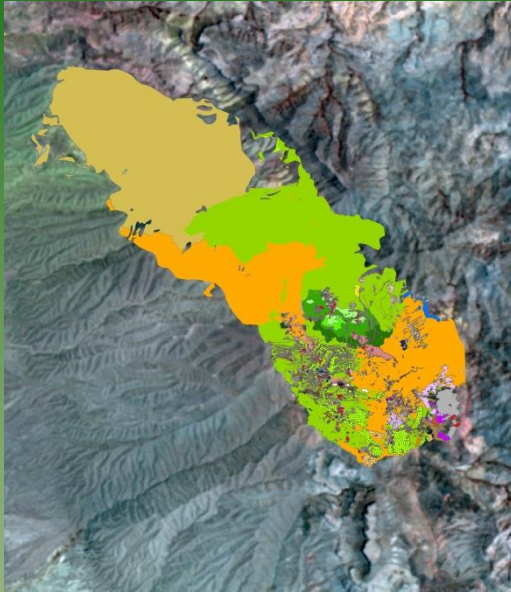
JANUARY 2006



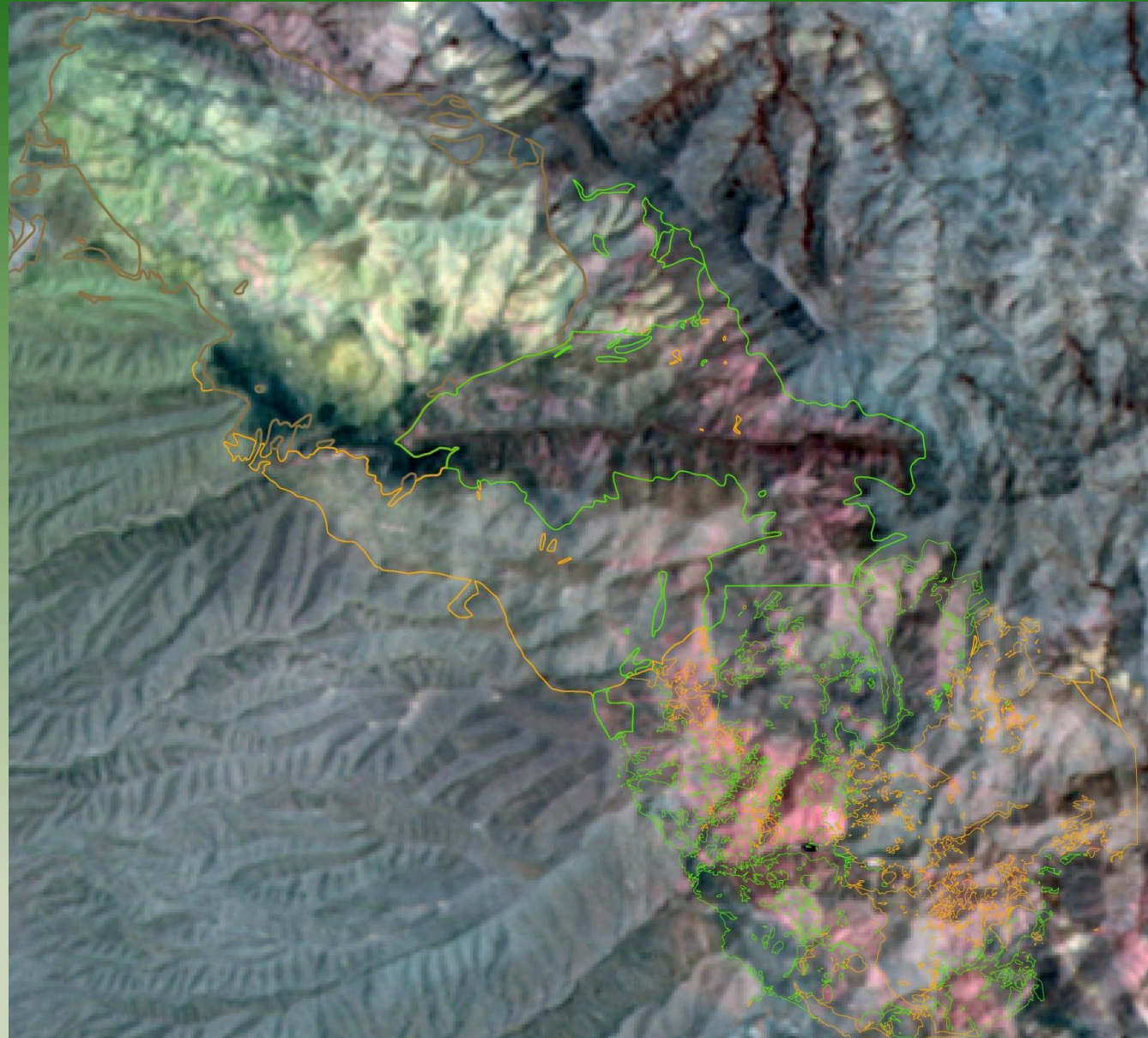
Copper Creek is an old mining district located on the east bank of the San Pedro River and on the western slope of the Galiuro Mountains about 75 miles northeast of Tucson,

Copper Creek is a large “Early Halo” Porphyry Copper Deposit, close to current producing large mines. It has District size potential as it covers nearly 29 square miles of contiguous property with less than 5% explored. The current resource area is ~4km in length and open in all directions. Ongoing work programs have resulted in extensive geological, geochemical and geophysical databases. Over 650,000 feet of drilling has been completed and is ongoing. An amended Preliminary Economic Assessment (PEA) was completed in October 2013 and in 2014 Copper Creek became a Joint Venture project with Anglo American.

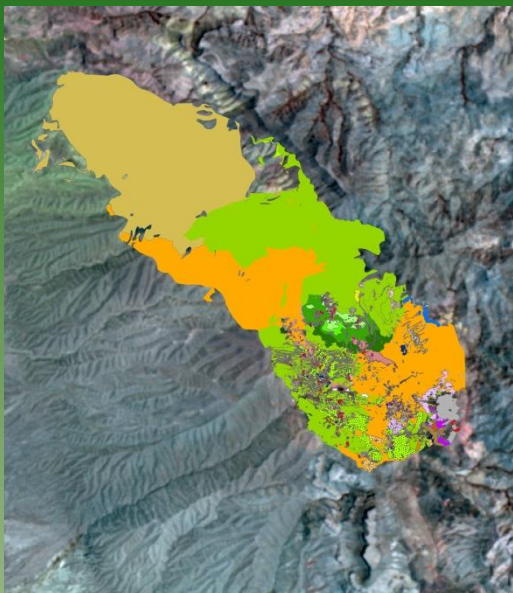
COPPER CREEK, ARIZONA



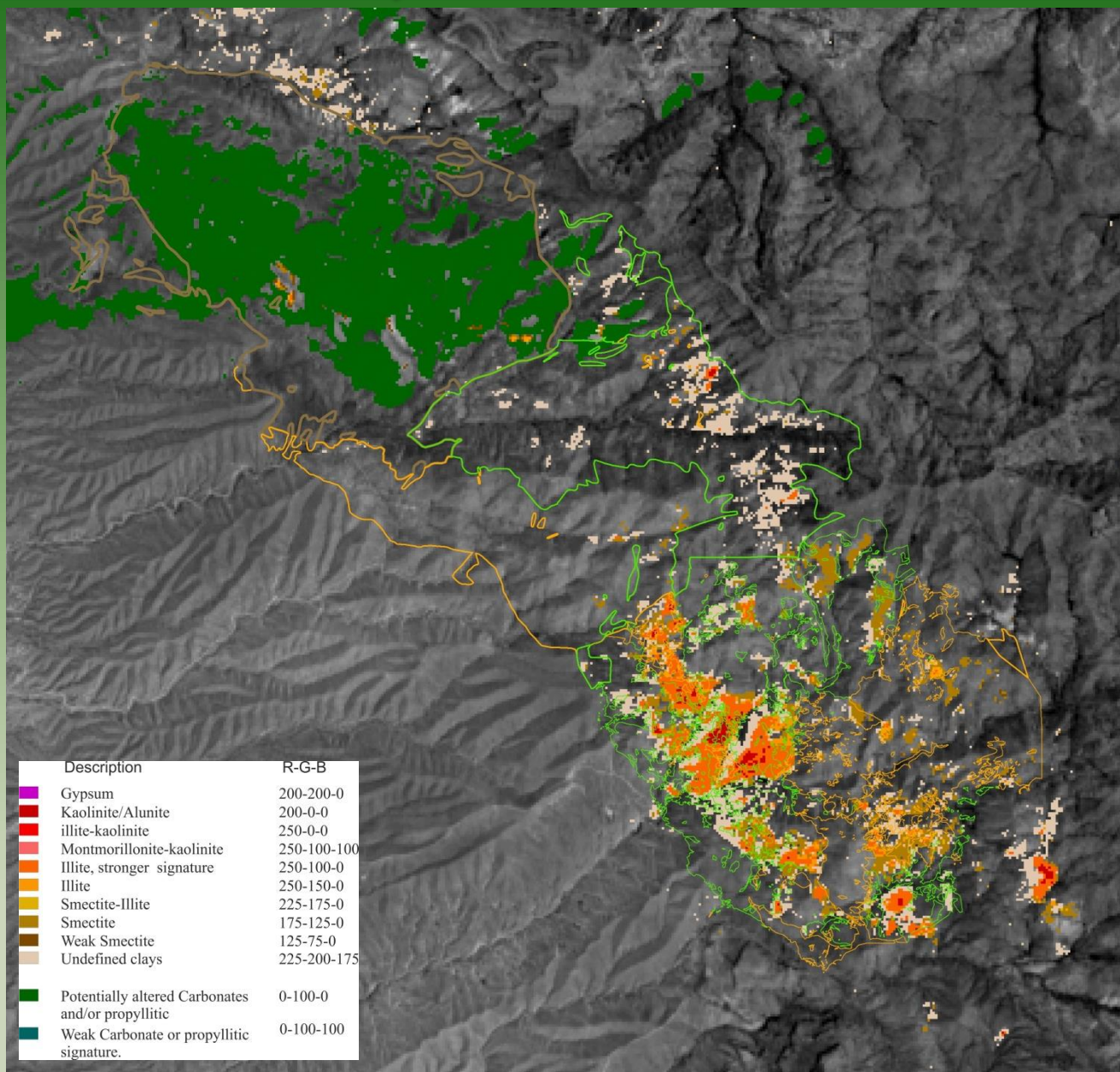
Aster SWIR 468

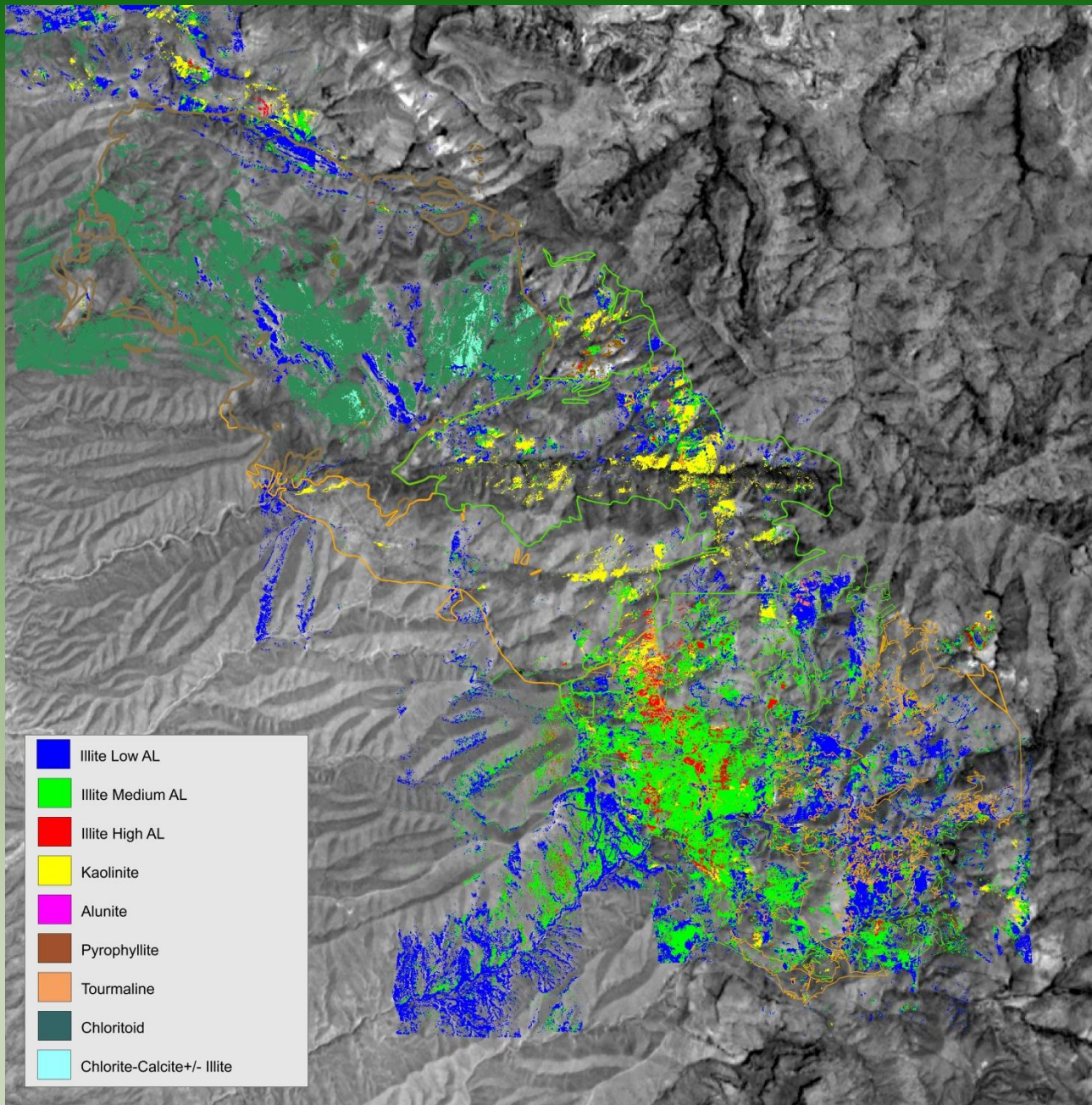
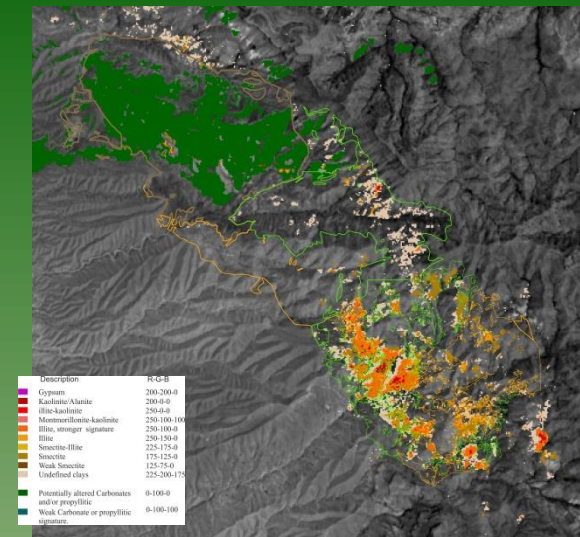


COPPER CREEK, ARIZONA



Aster study 2011
Alteration image



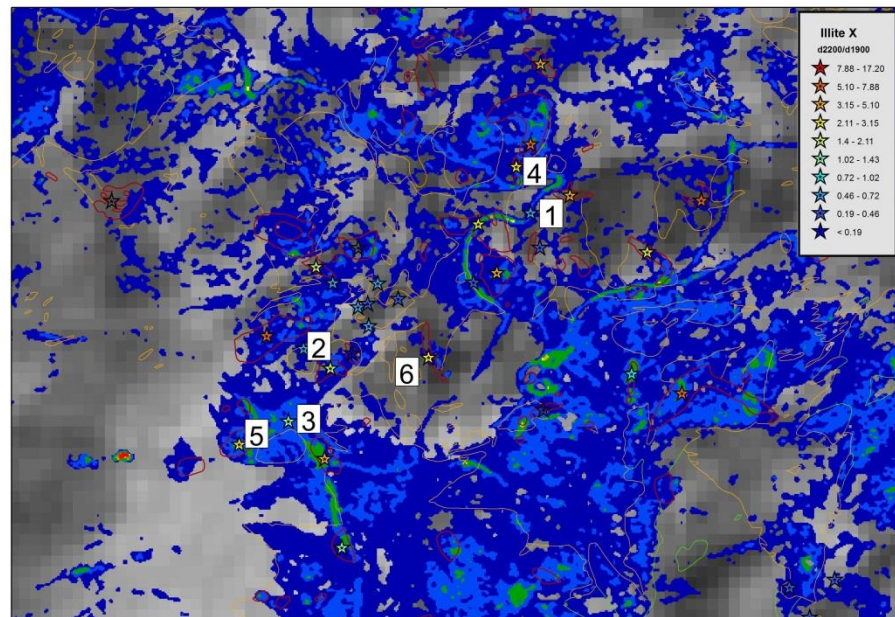
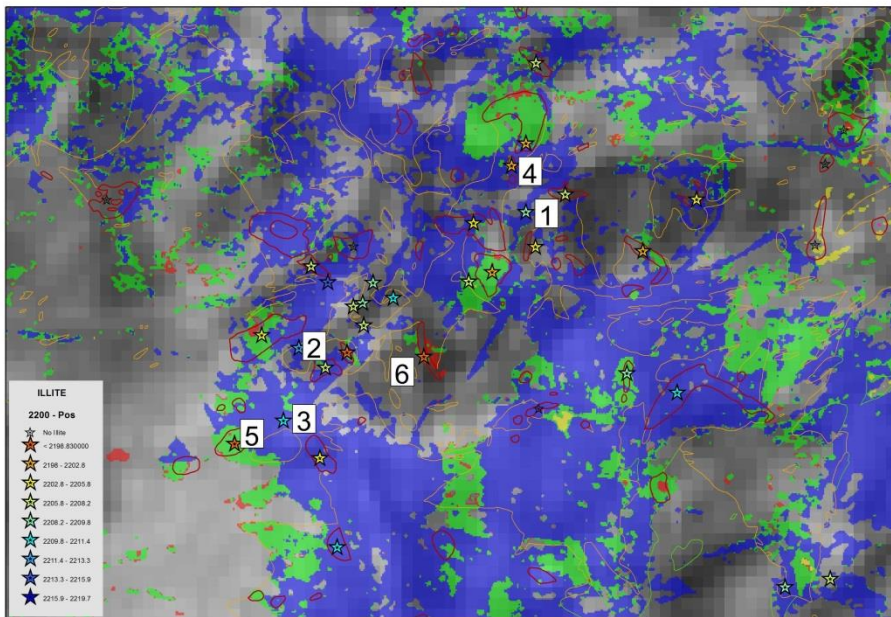


Hyperspectral survey
 July 2015
 SpecTir Aisa Dual
 2m.resolution

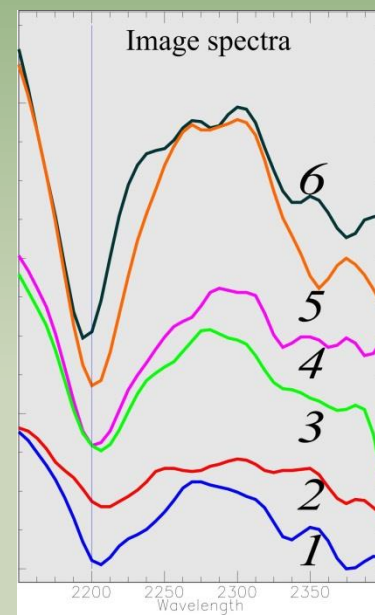
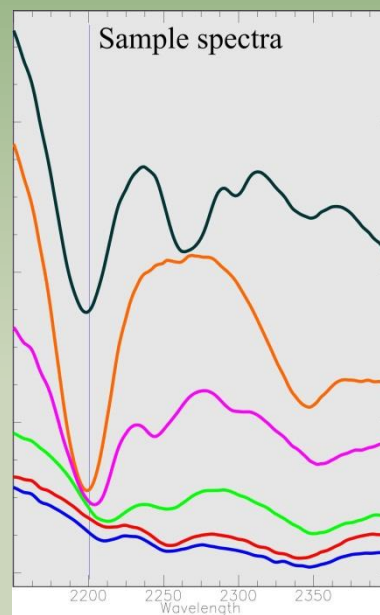
Alteration image



COPPER CREEK, ARIZONA



Spectral Evolution PSR-3500 Spectroradiometer



Laramide orogeny, Arizona, New Mexico Sonora & Chihuahua



Environmental Monitoring

Urals: KARABASH

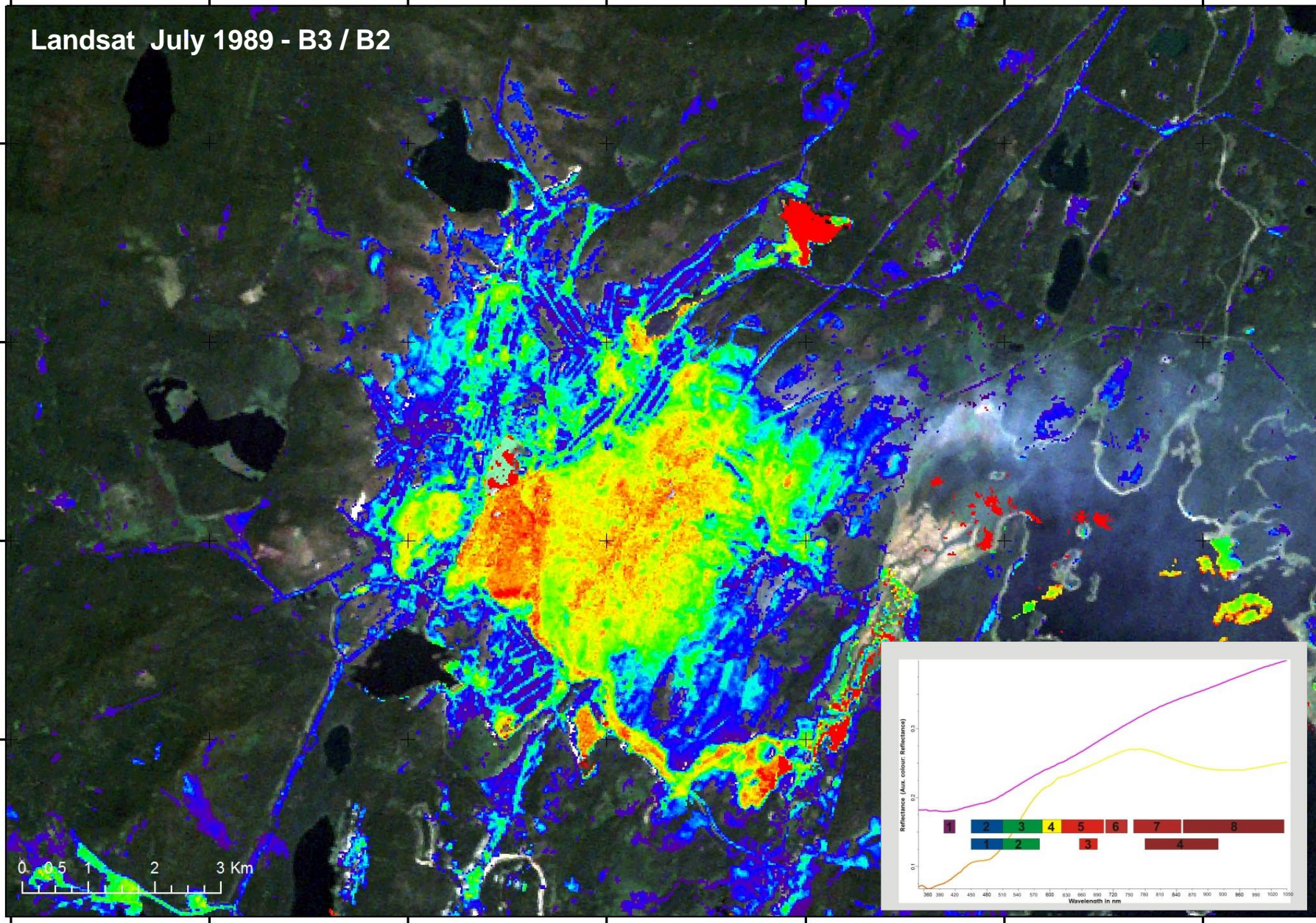


- 1822 Gold Mining
- 1833 Cu- smelting
- 1910 Blister Copper Smelting
- 1994 Ecological Disaster Zone
- 1998- 2007 Construction New smelter
- Production at Half Capacity
- Dirtiest Place in Russia

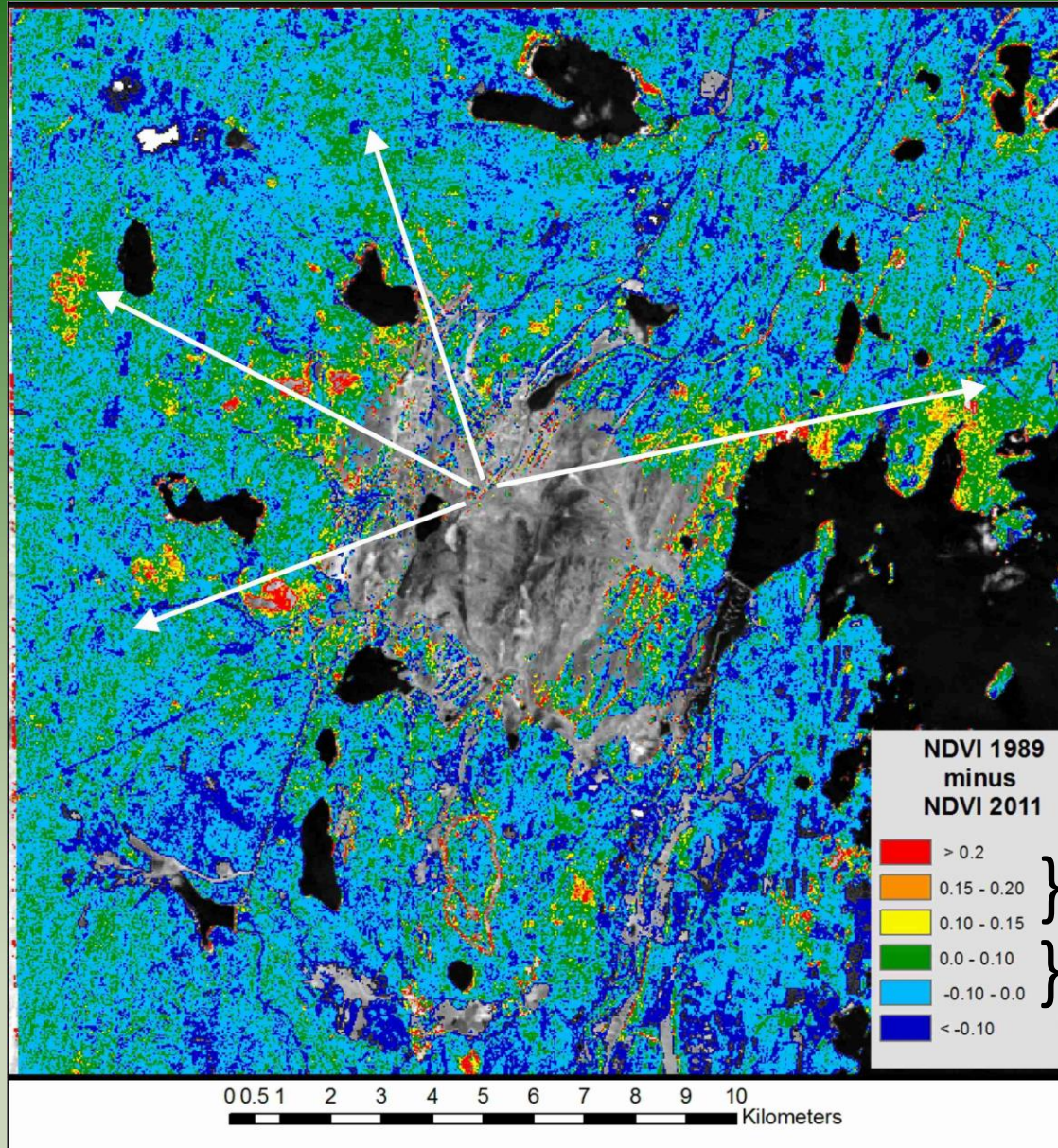
- Immense SO₂ - Emissions
- Fall-Out Metal-rich Particulates
- 27% Population Healthy
- Birth Defects
- Skin Diseases
- Heavy Metal Poisoning (>35% lead in air)
- Lung Diseases
- Alcohol & Poverty



Landsat July 1989 - B3 / B2



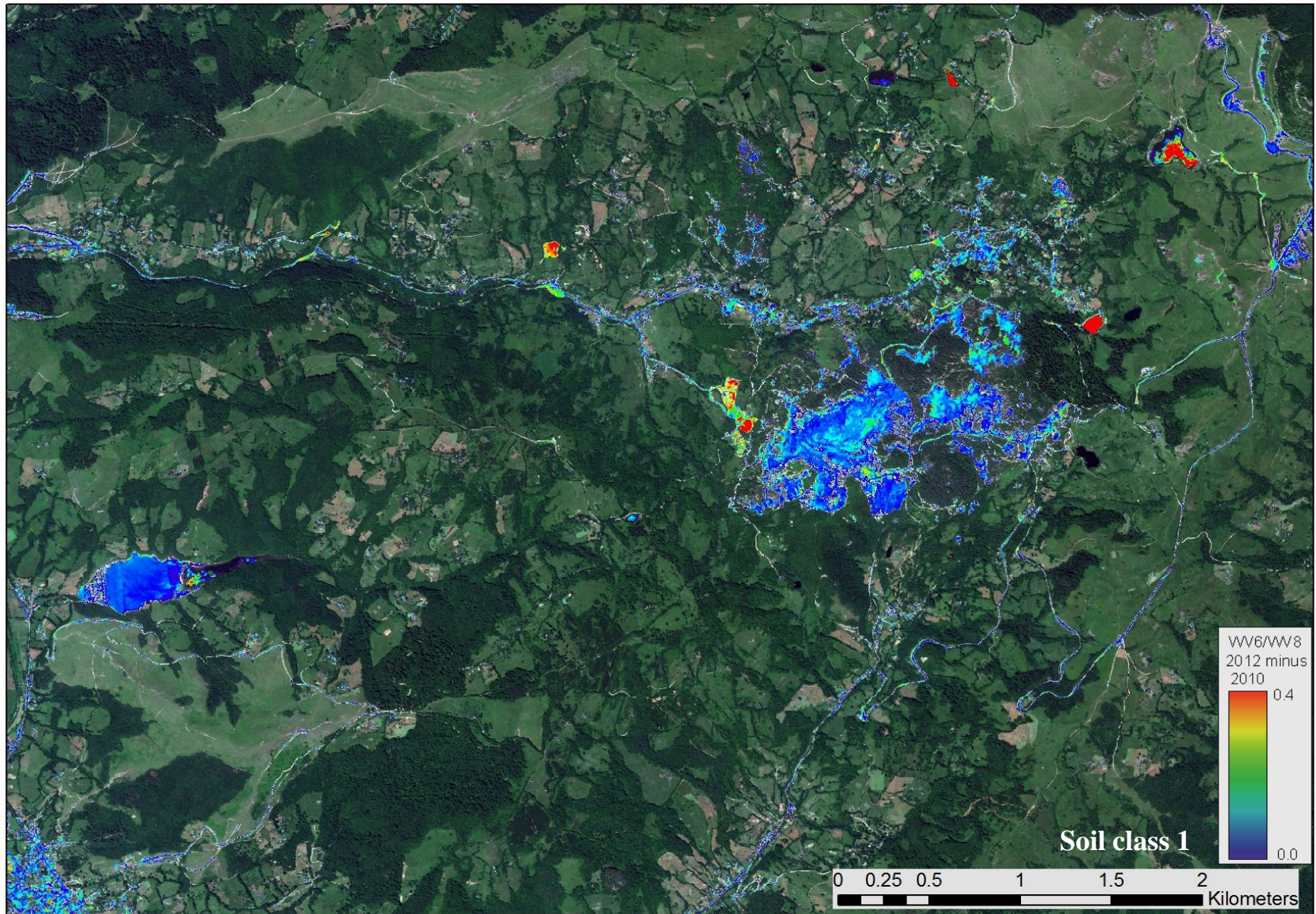
- 1998- 2007 Construction New smelter: Does it work????



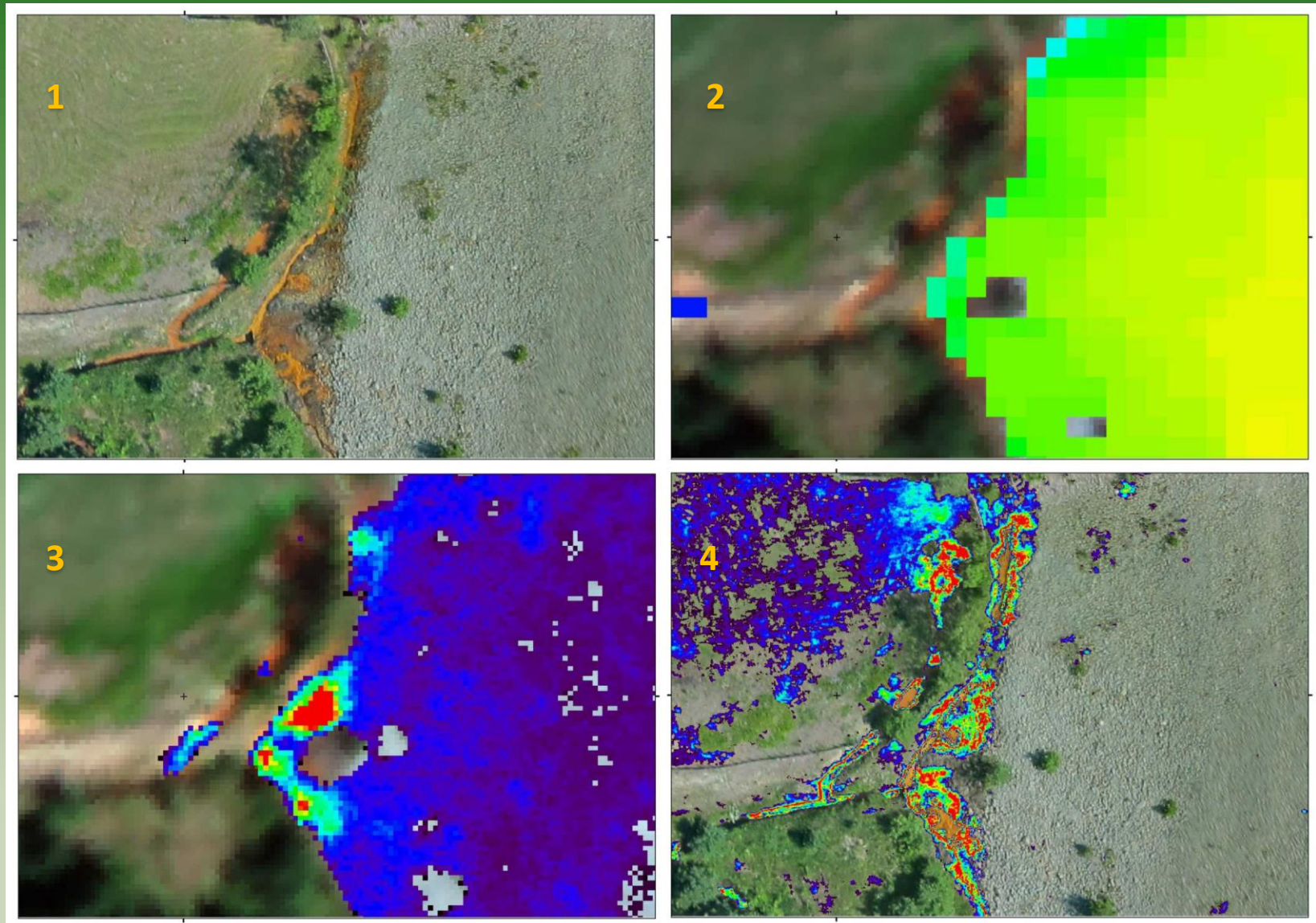
ROŞIA MONTANA GOLD MINE, ROMANIA



Mapping of soil degradation



Acid drainage: Mapping of Iron oxides



1) Drone Natural Colour image; 2) Worldview 2, 50 cm; 3) Airborne Hyperspectral 50 cm; 4) Drone 5 cm



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FreshWallpapers.Net

