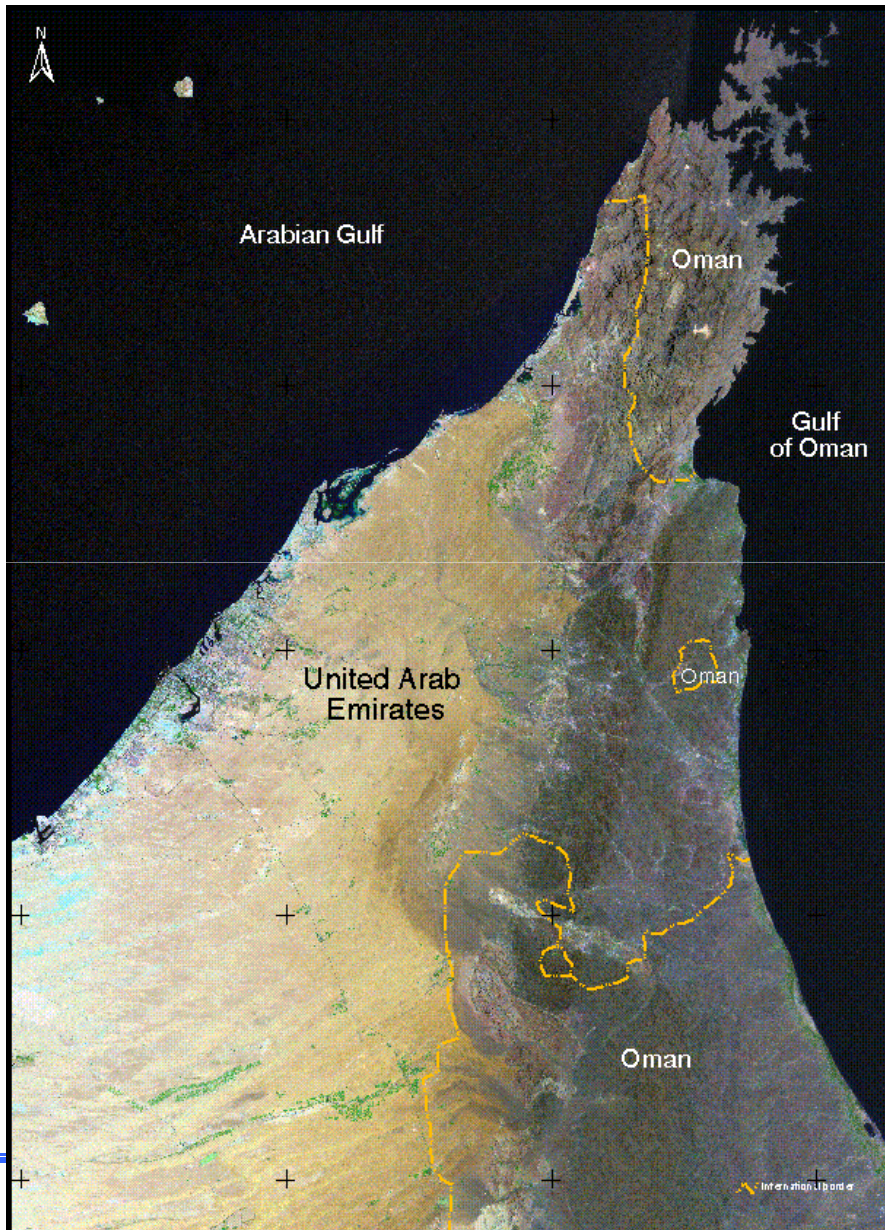


Case Studies

- Exploration of Water Resources in United Arab Emirates
 - Land Use Changes in a Wetland Area in Spain
-

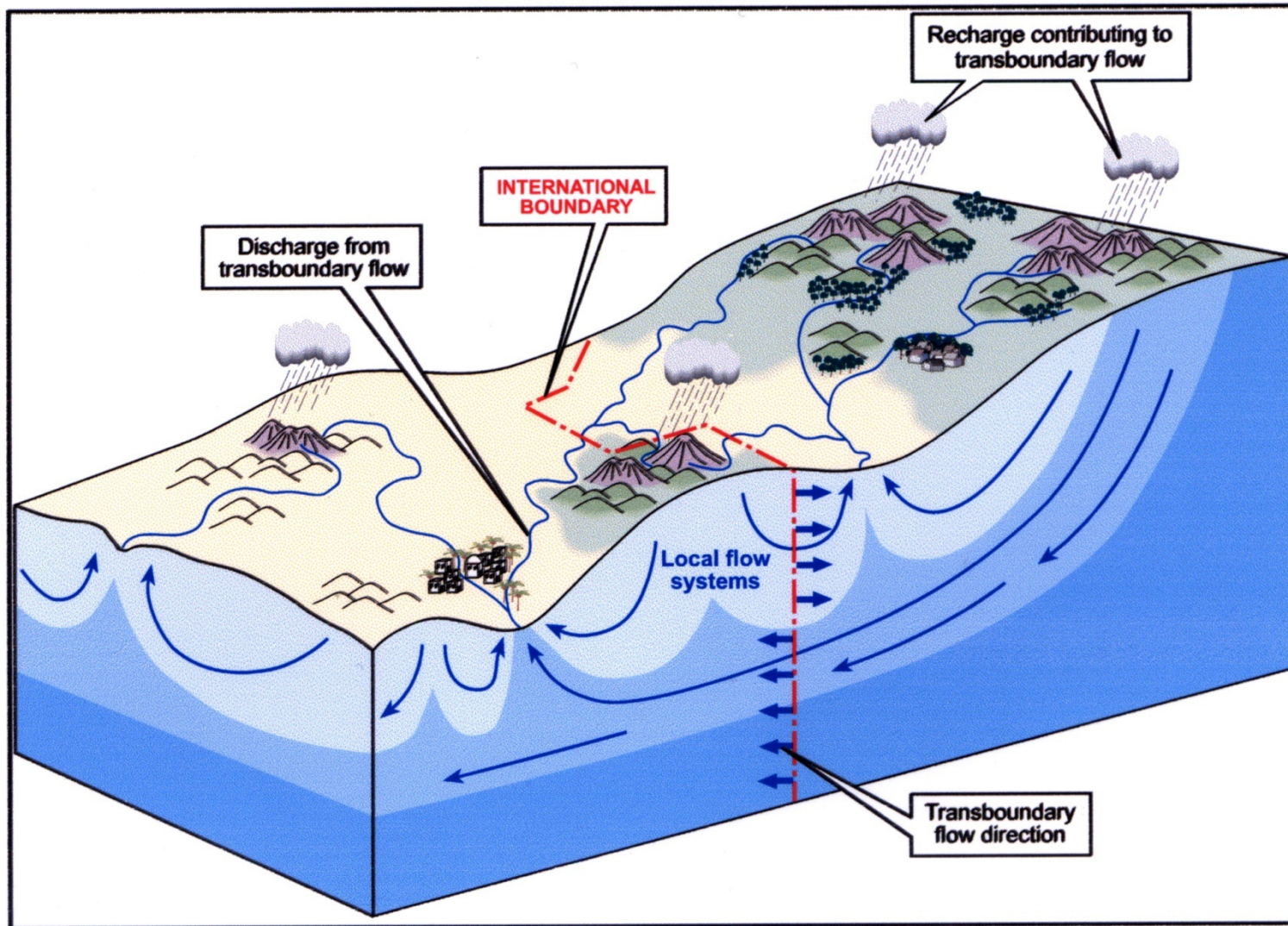
Water Resources in U.A.E.



Research Components

- Analysis of Precipitation Data
- Vegetation Mapping & Classification
- Land Cover / Land Use Mapping
- Structures & Drainage Mapping
- Thermal Anomaly Mapping
- GIS Spatial Correlation Analysis
- Hydrologic Modeling
- Recommended Sites

Arid Land Hydrology

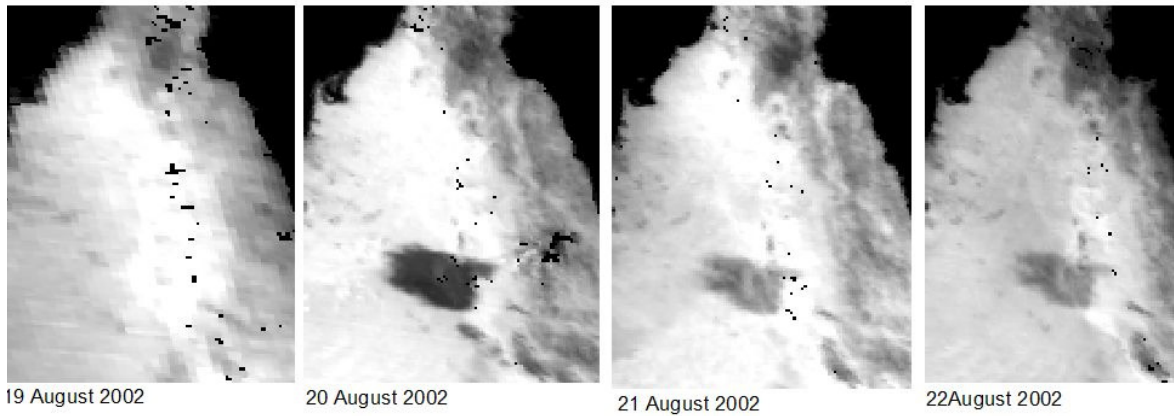
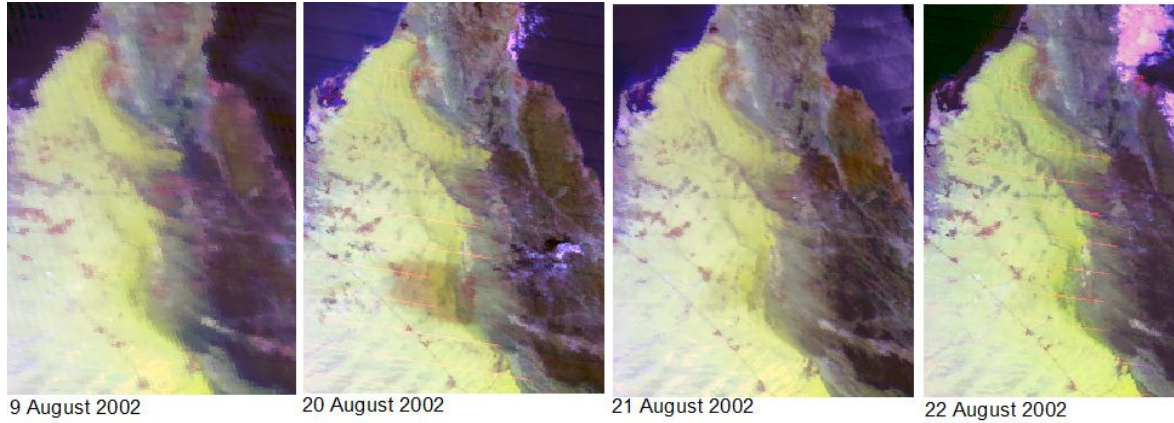




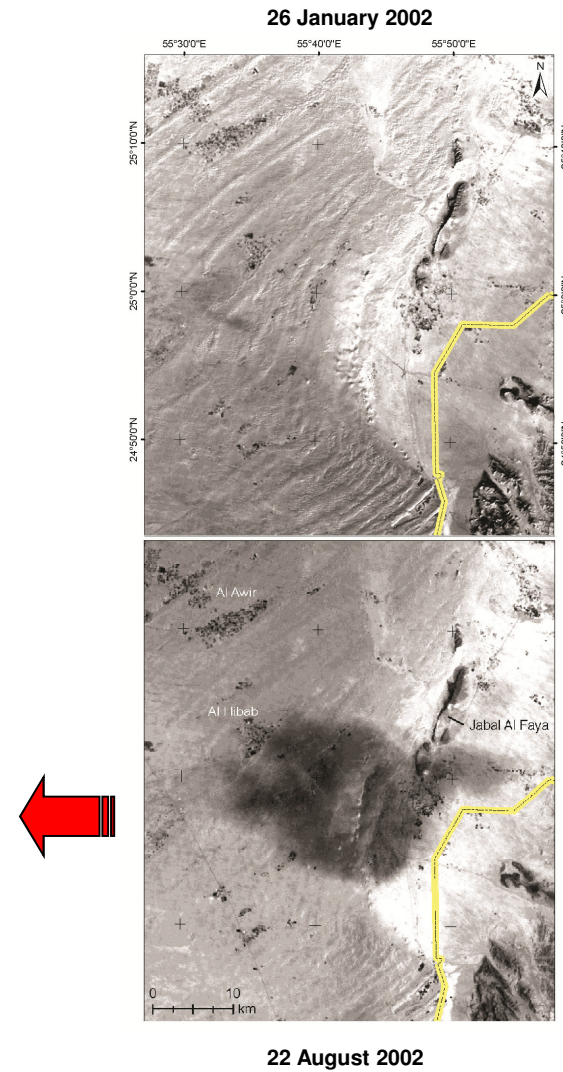


Thermal Anomalies (Inland)

MODIS - Optical



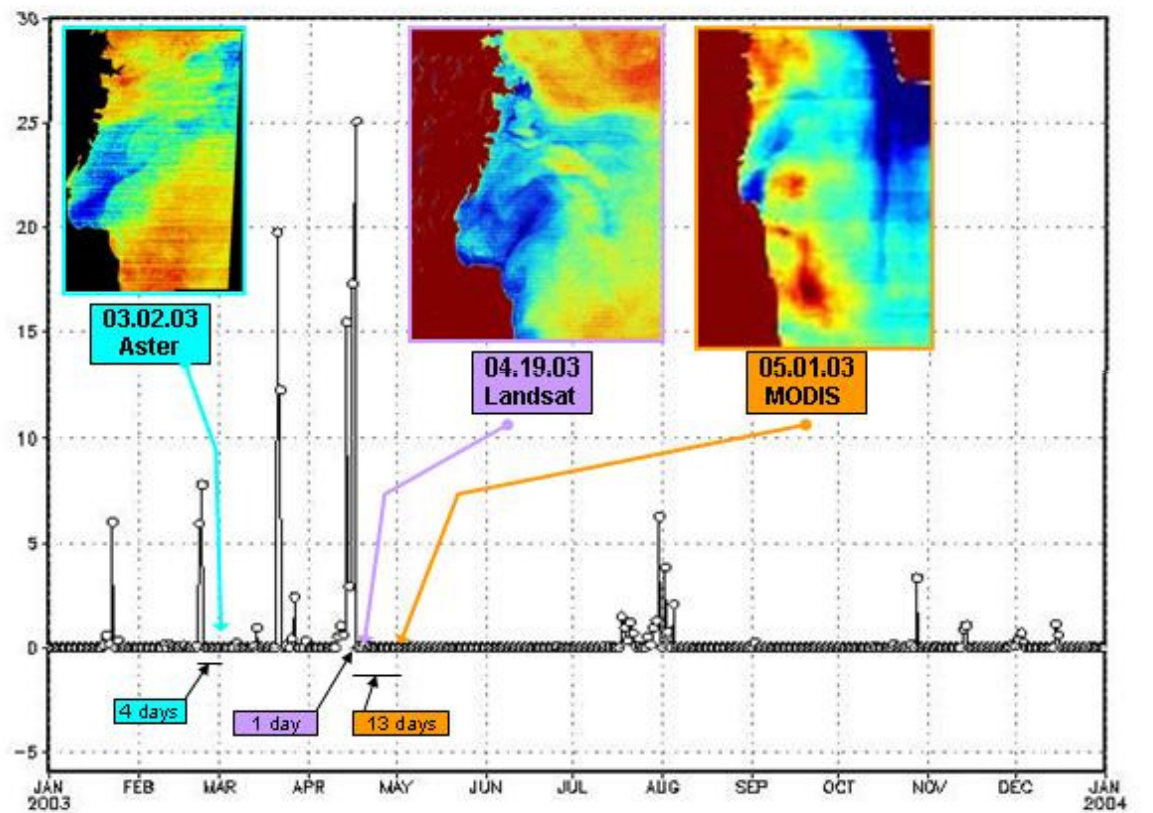
MODIS - Thermal



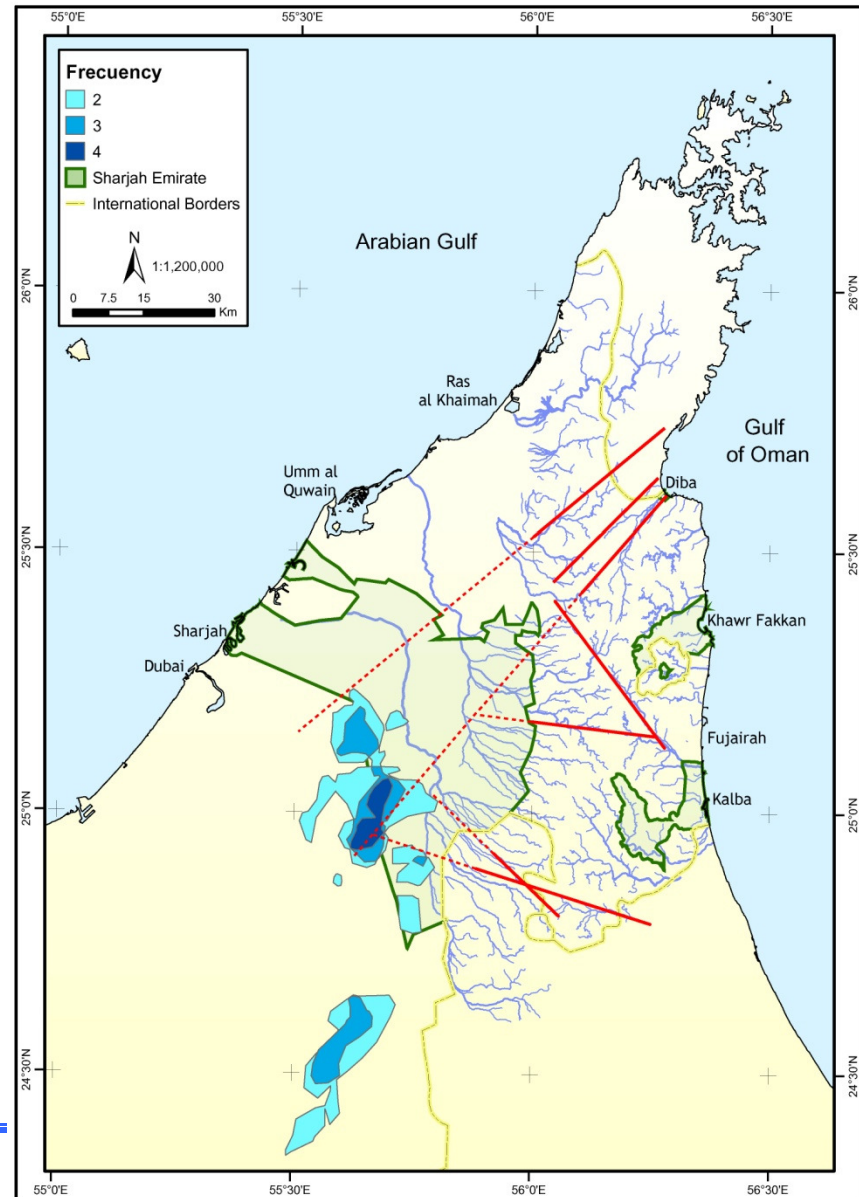
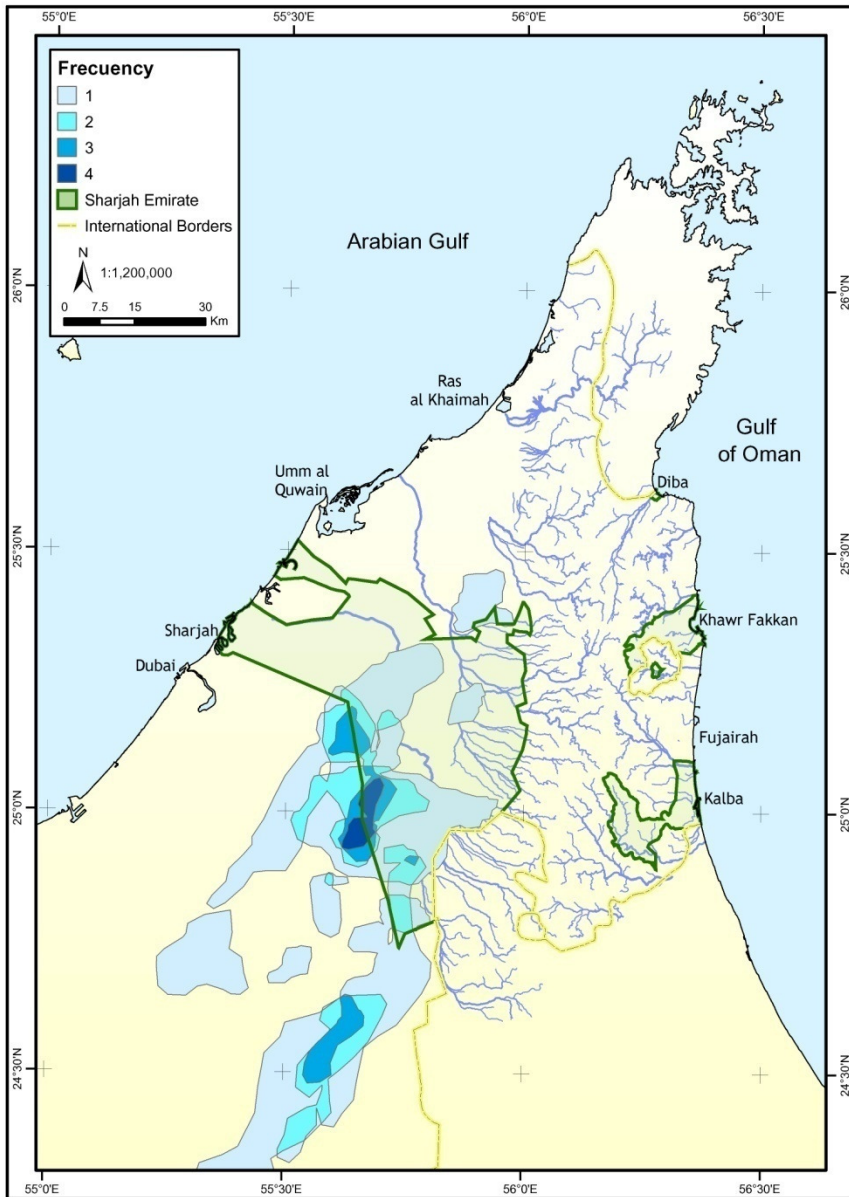
ASTER - Thermal

Thermal Anomalies (Offshore)

Accumulated Rainfall (mm) from the Tropical Rainfall Measuring Mission (TRMM)



Thermal Anomalies & Drainage / Fractures



Water Demands for Agriculture

- Agriculture is the principal consumer of global fresh water
- Irrigation is expected to supply 50% of the world's food production requirements
- 75 % of irrigated land lies presently in developing countries
- Soil and water salinity is a major global threat to sustainable irrigation agriculture
- 2nd only to erosion, salinization is the leading cause of soil degradation

Region	1996		2000		% increase
	Km ²	%	Km ²	%	
Abu Dhabi	476.96	59.70	2351.04	86.01	393
Central	166.14	20.79	192.99	7.06	16
Northern	97.51	12.20	113.40	4.15	16
Eastern	58.36	7.30	75.89	2.78	30

Change in total cultivated area in UAE between 1996 and 2000.

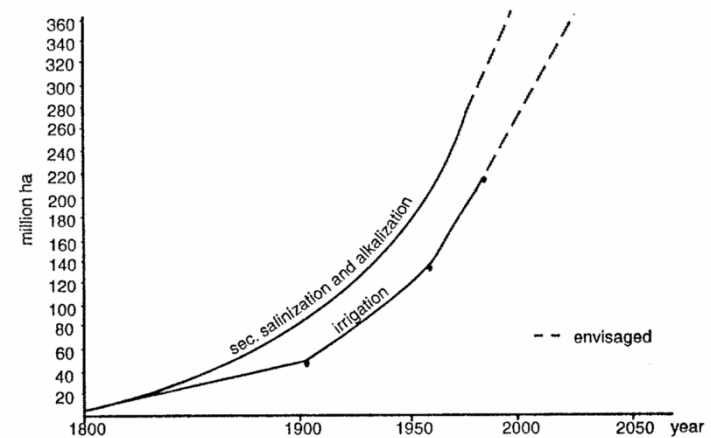
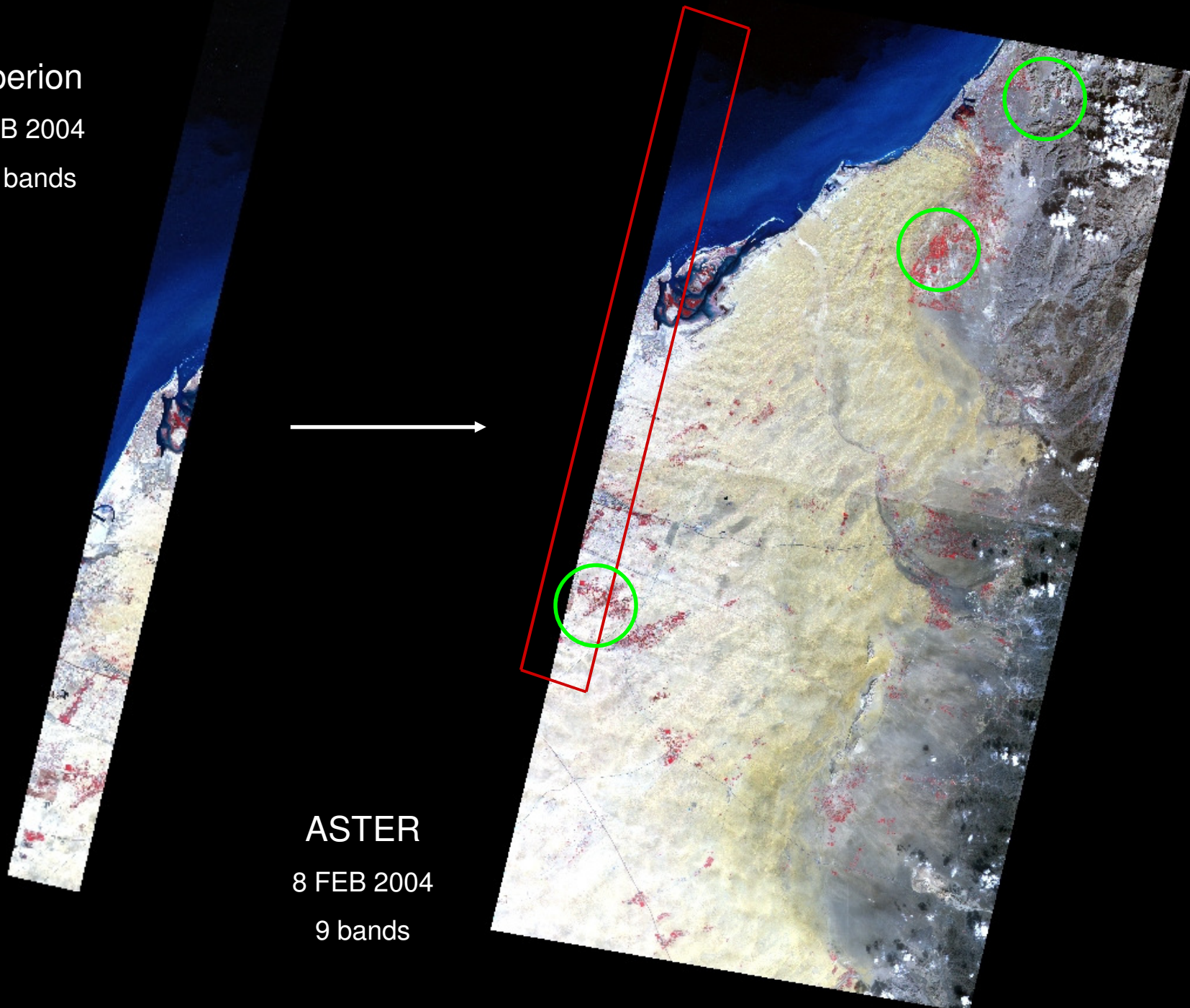


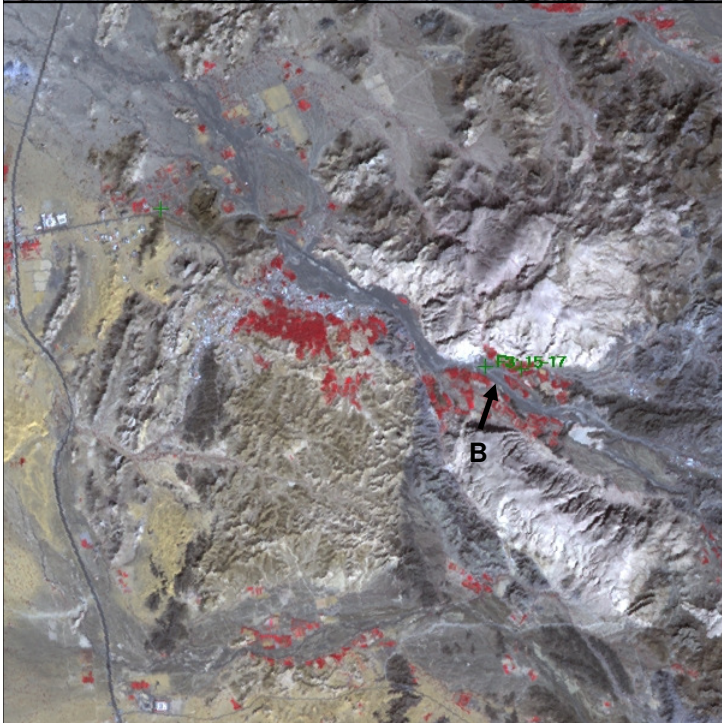
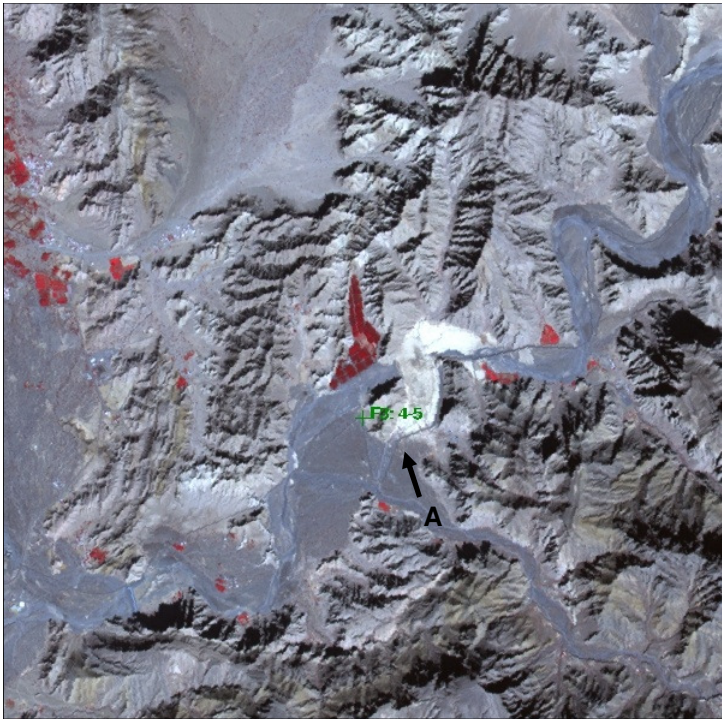
Figure 3. Global development of irrigation and secondary salinization of soils.

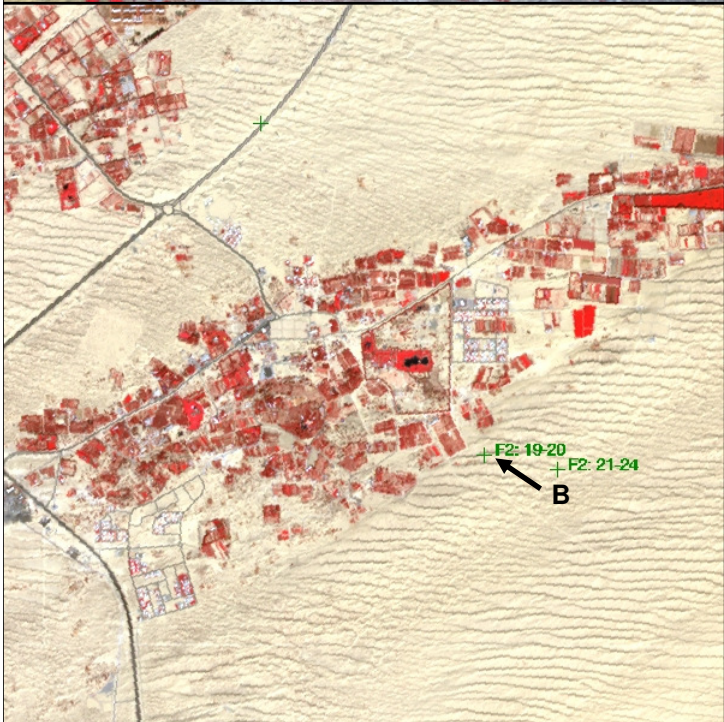
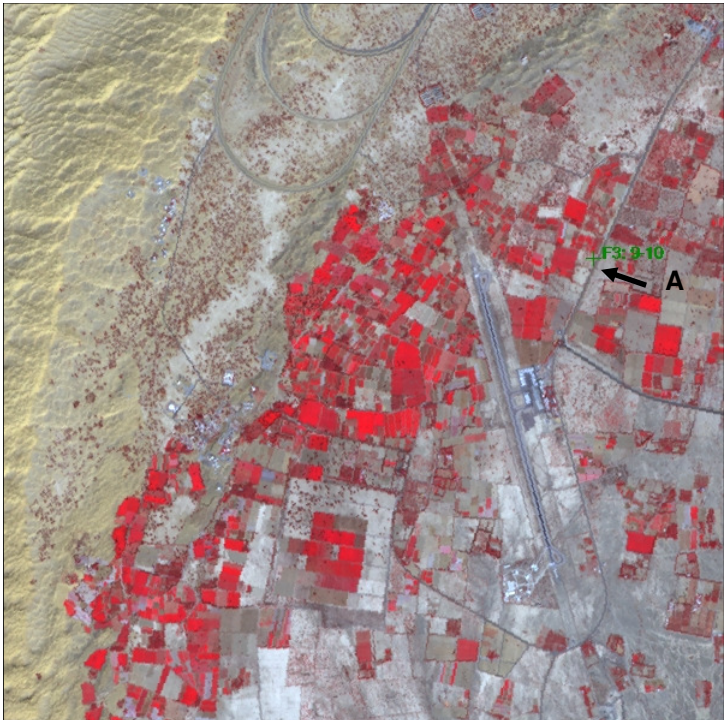
Hyperion
8 FEB 2004
158 bands

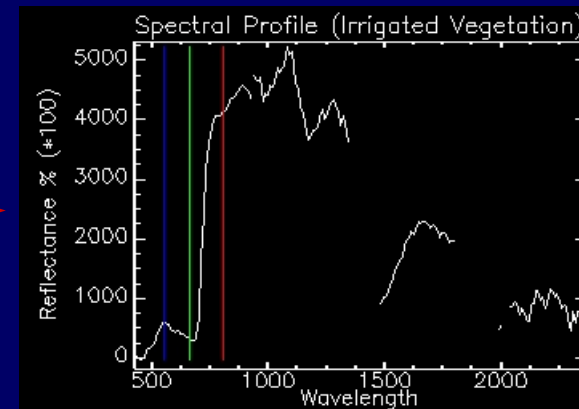
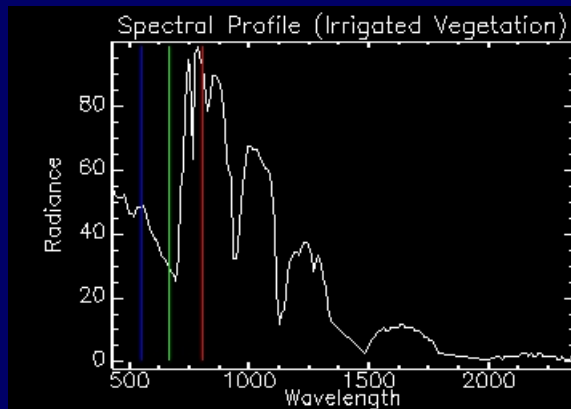


ASTER
8 FEB 2004
9 bands









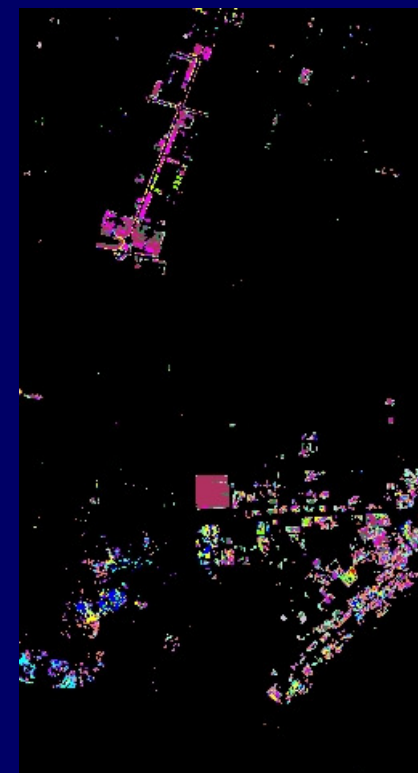
Conversion: At Satellite Radiance to Ground Reflectance Values



NDVI
Mask



ISODATA

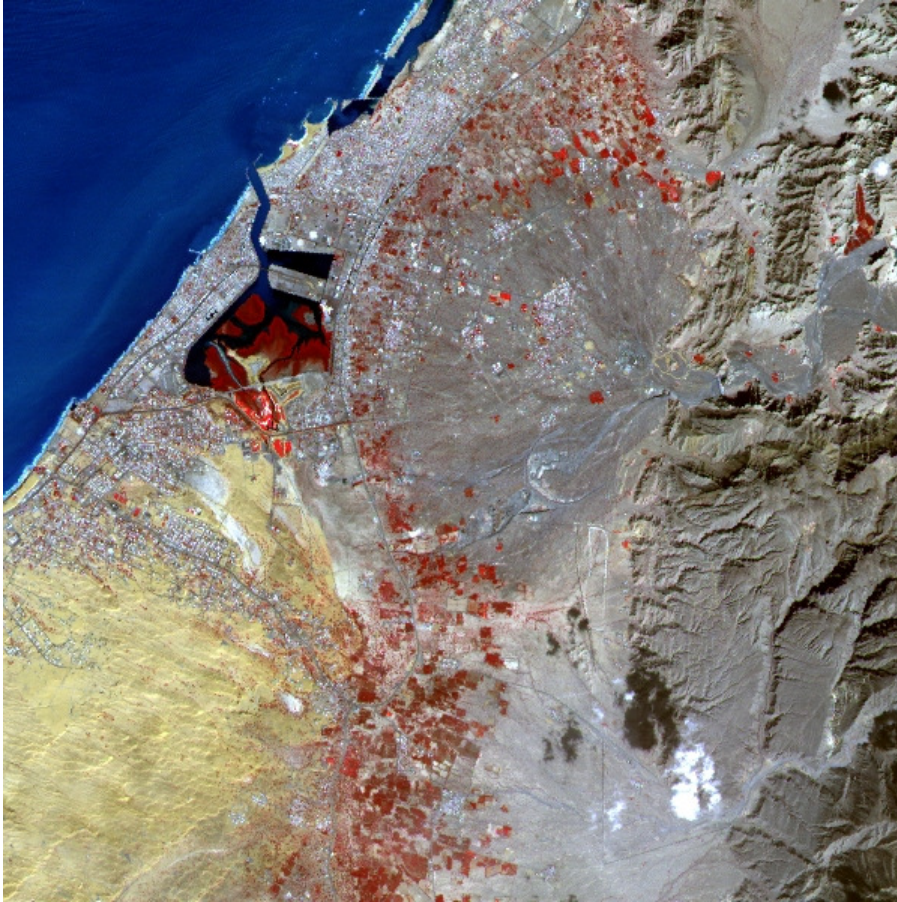


Hyperion (RGB = 45,31,20)

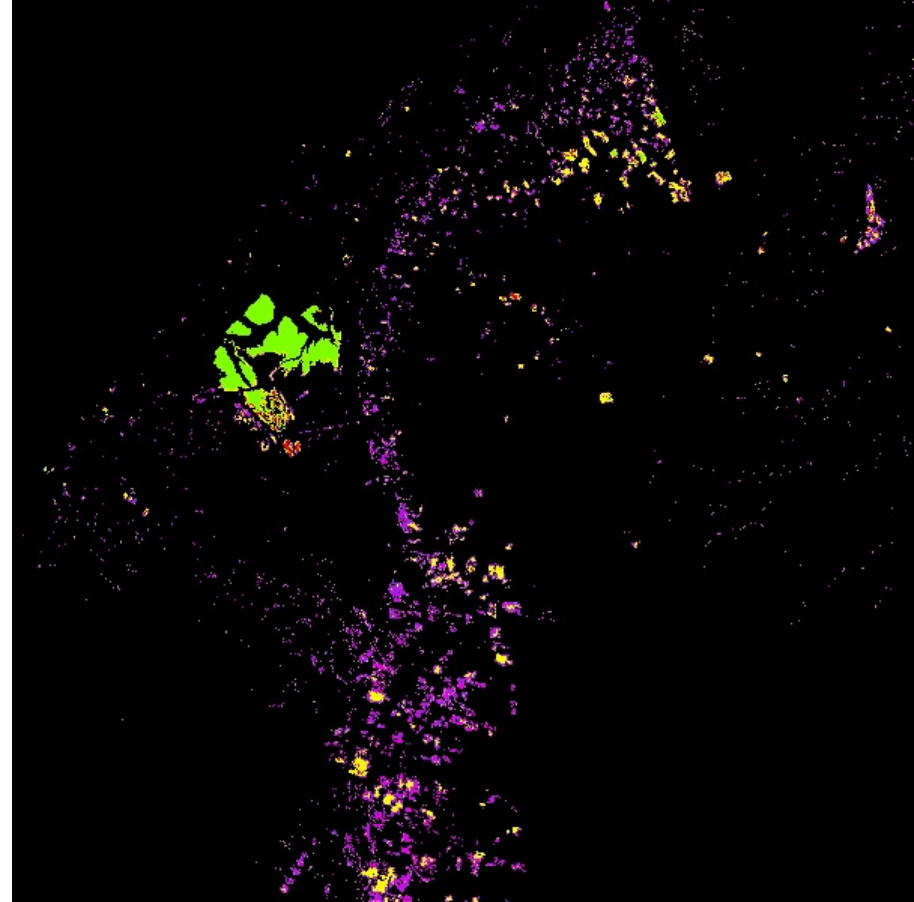
Unsupervised Classification of Vegetated Areas

Classification of Vegetation

ASTER Image (RGB = 3, 2, 1)



Spectral Angle Mapper Classification



Discrimination of three main vegetation groups: **mangroves**, **irrigated crops** (e.g., alfalfa), **irrigated trees** (e.g., fruit / palm trees)

Remote Sensing of Agriculture

- Identification of vegetation types (crops) and their areal extent ⇒ change detection
- Maps of distribution, amount, type, and seasonal changes of vegetation patterns allow determination of rates of evapotranspiration, type of irrigation system used, and amount of water consumption
- Advantages of using multisensors:
 - ⇒ high spectral resolution of hyperspectral, and high spatial and temporal resolution of multispectral images
 - ⇒ extrapolation of detailed information over time and space enables change detection studies

Land Cover/Use Change in Los Monegros

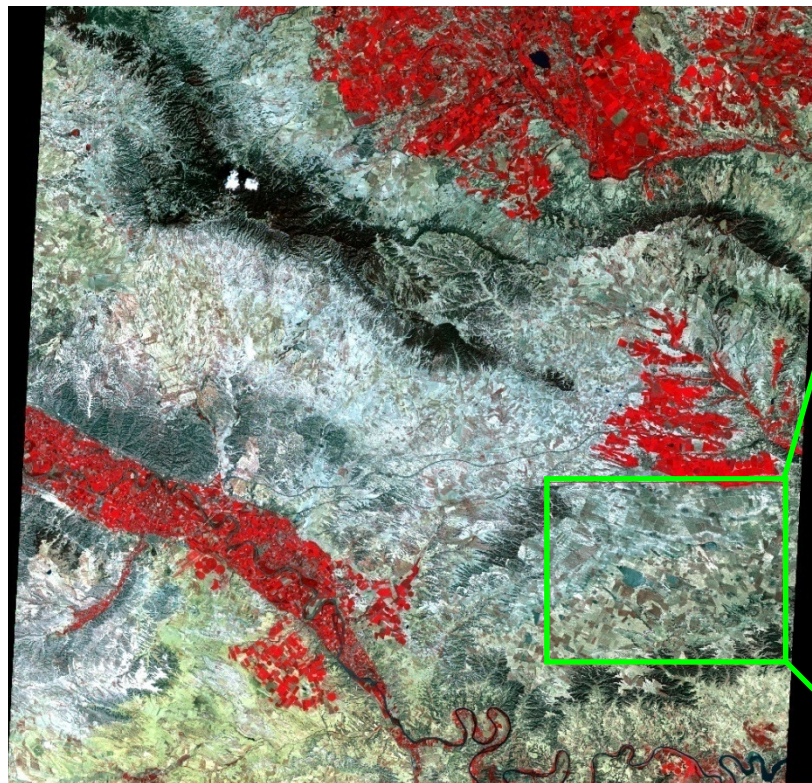
Los Monegros area of NE Spain is experiencing significant land use change due to the introduction of extensive irrigation systems.

Current agricultural policy encourages farmers to plough marginal areas; and the effect of ploughing combined with land use changes may trigger/accelerate land degradation processes (water/wind erosion, soil salinization, vegetation loss).

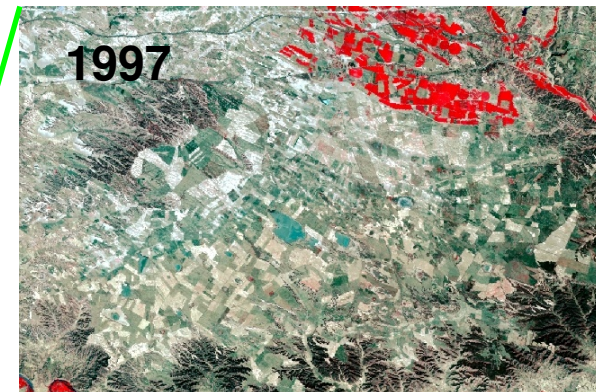


Impact of Agriculture on Wetlands

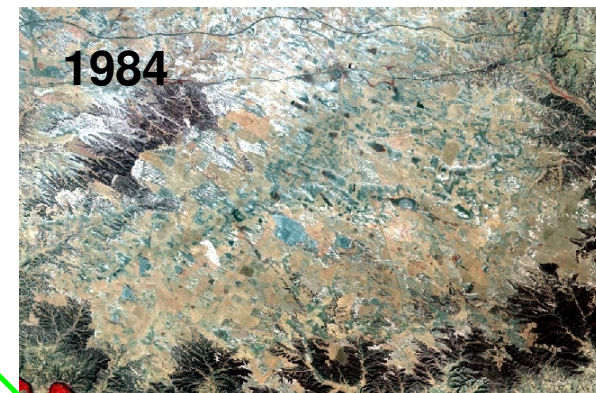
It is expected that changes in agricultural practices will have a profound impact on the ecology. Dryland farming was the traditional way of agriculture. However, a large scale irrigation project begun in 1986, bringing water from nearby rivers through a network of canals to this semi-arid environment.



ASTER 30/08/2002

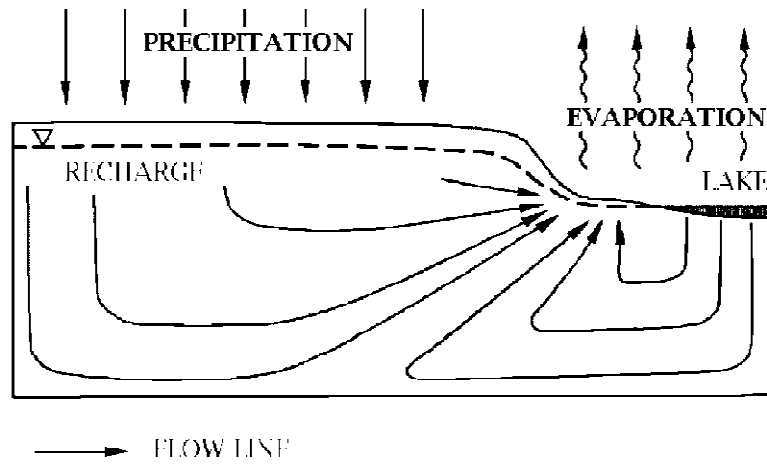


TM 07/07/1997



TM 20/08/1984

Hydrology of Playa Lakes



Doline filled with water

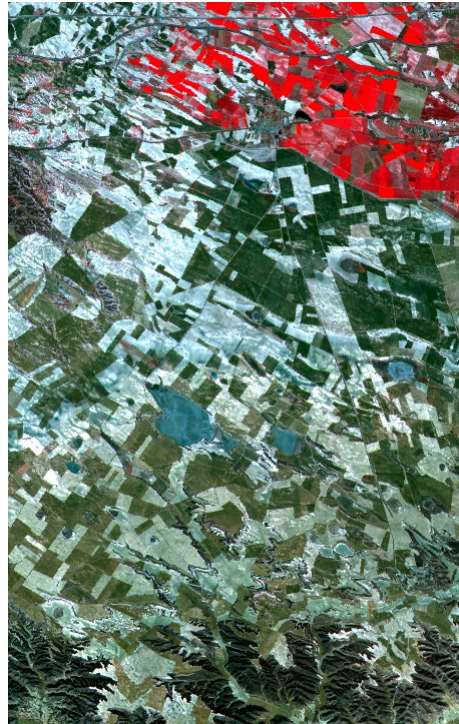


Gypsum outcrop

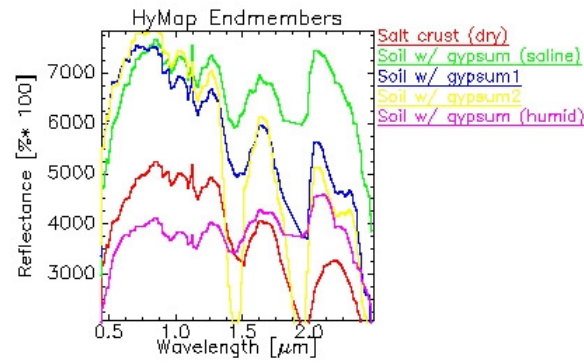


Playa lake with salt crust

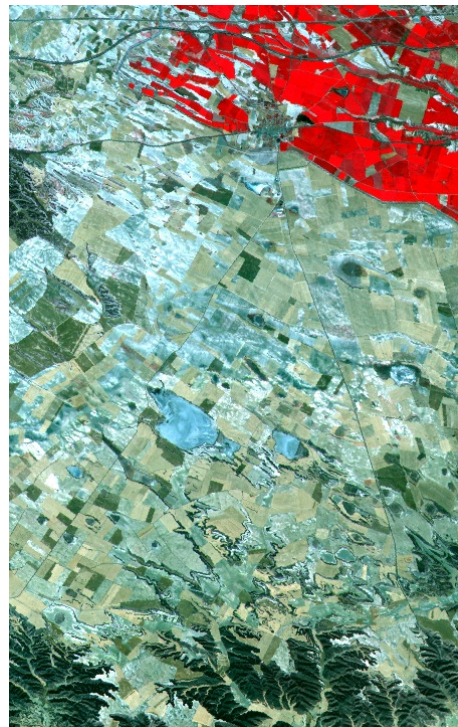
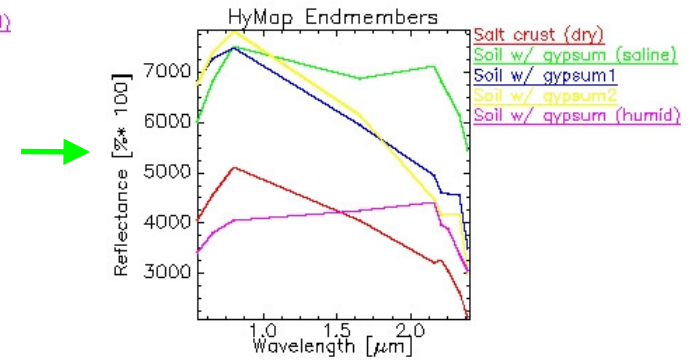
Detecting & Mapping Soil Salinity



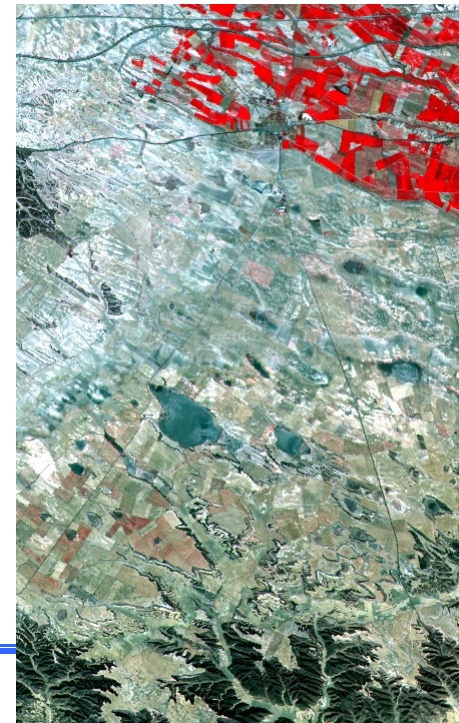
16 June 2004



Reference Spectra

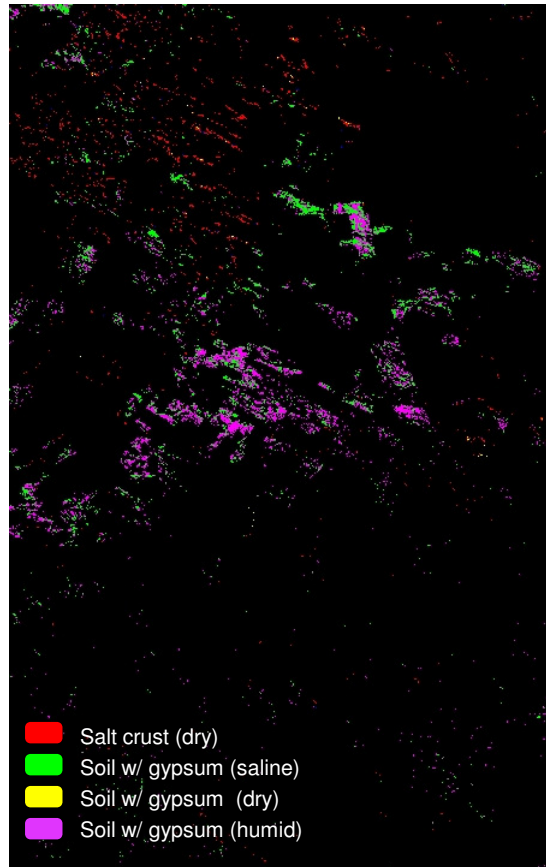


2 July 2004

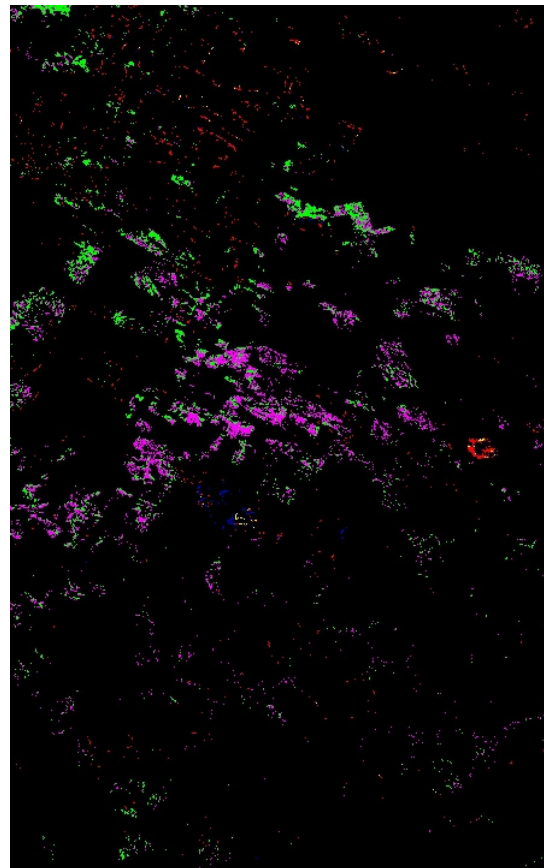


5 July 2005

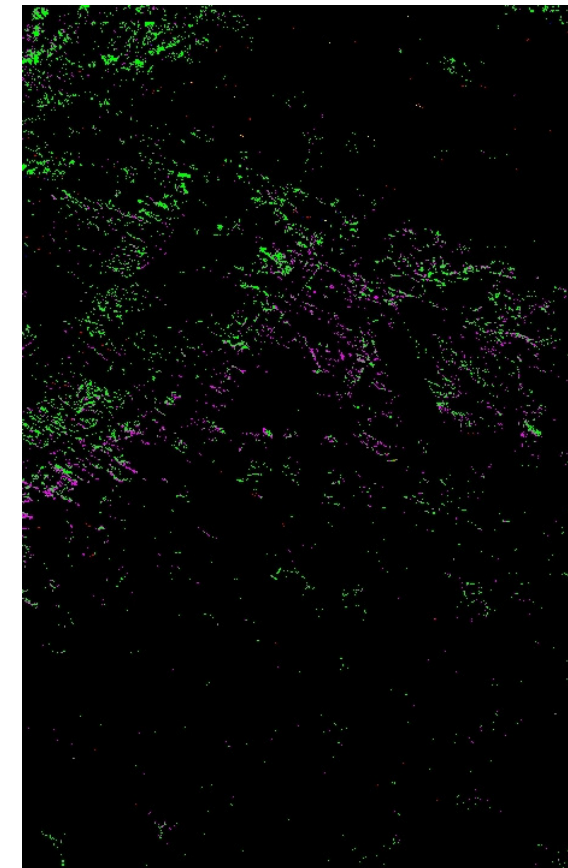
Temporal & Spatial Distribution of Saline Soils



16 June 2004



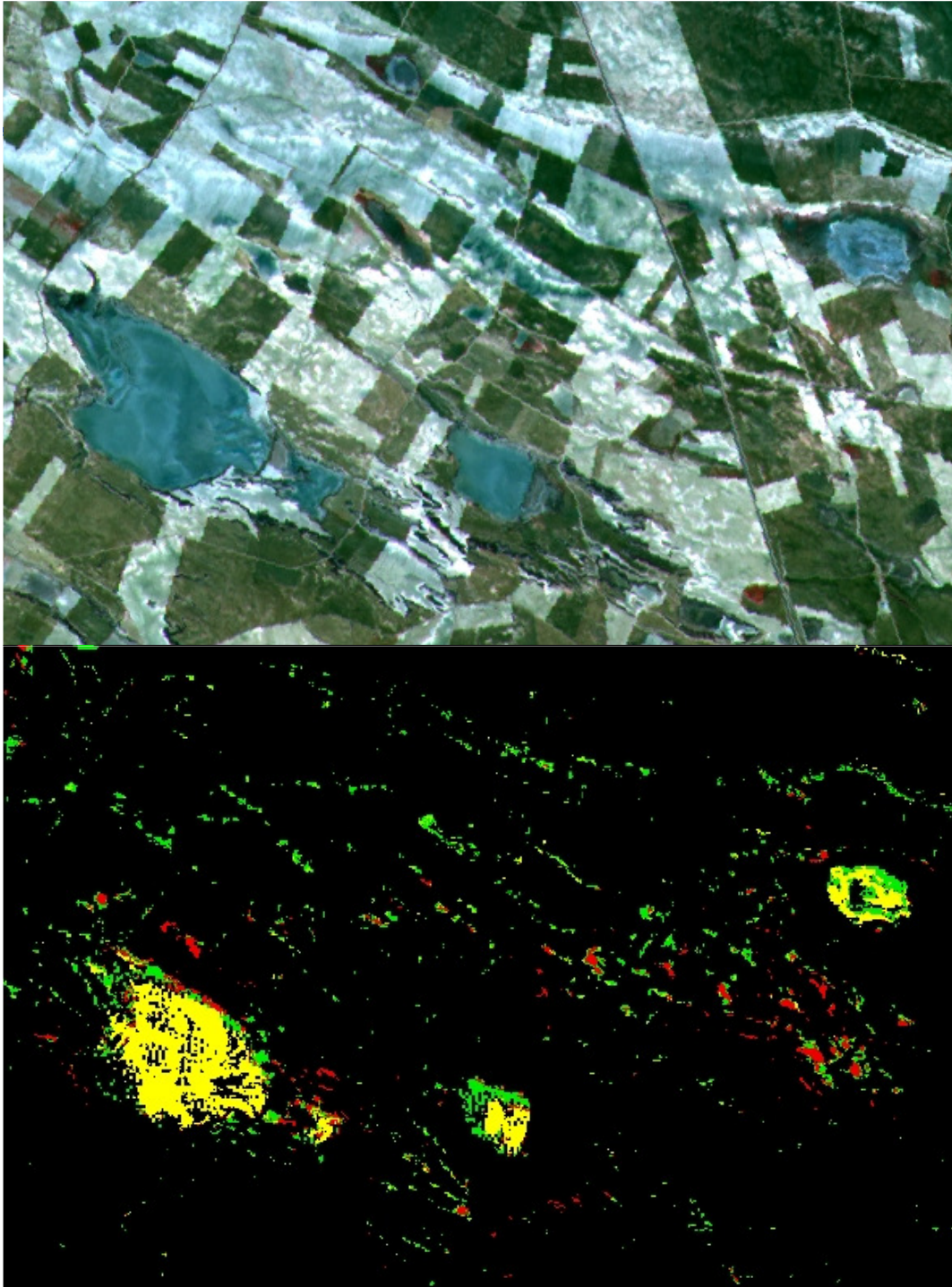
2 July 2004



5 July 2005

Spectral Angle Mapper: is a physically based classification method where image spectra are compared and matched to reference spectra (endmembers).

ASTER 16 June 2004



Soil Characteristics

- **S08:** Salt crust (very high content of soluble salts and some gypsum).
- **S09, 11, 13:** Salt-affected soils (salt efflorescence).
- **P21:** Gypsiferous soils with some calcite (Gypsic Regosols).

Concluding Remarks

- As population increases – demand for new land & water resources (especially in drylands that support agriculture)
 - Dryland ecosystems are very fragile and react quickly to adverse environmental changes (water & vegetation stress, prolonged draughts)
 - Sustainable land development and water resources usage presents a global challenge
 - Drylands are especially susceptible to land degradation processes (soil erosion & salinization), land surface hazards (land slides, flash floods) and lack of water resources
 - Mapping, monitoring, managing these ecosystems is essential in order to preserve them for future generations
-