



**Workshop on Tools for Emergencies and  
Disaster Management  
Earth Observation in One World**

**September 7 — 9, 2005**

**Masaryk University in Brno**

**Centre of Biostatic and Analyses**

**Czech Republic**



# **The International Charter “Space and Major Disasters”**

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## Summary

- The International Charter “Space and Major Disasters”
- Why CONAE joins the Charter?
- CONAE Groundstation
- Some statistics on Charter Activations
- SAC-C Satellite
- One example of a Charter Activation.



## What is the Charter?





## Charter Overview

- The Charter is an international cooperation between space agencies, making their resources available to emergency and rescue operations **through Authorized Users**.
- Operational since November 1, 2000.



## Charter Agencies

- **Established in 2000 by:**

- **ESA**

- **CNES**

- **CSA**

- **Joined by:**

- **NOAA (Sept 2001)**

- **ISRO (Sept. 2001)**

- **CONAE (Aug. 2003)**

- **JAXA (February 2005)**

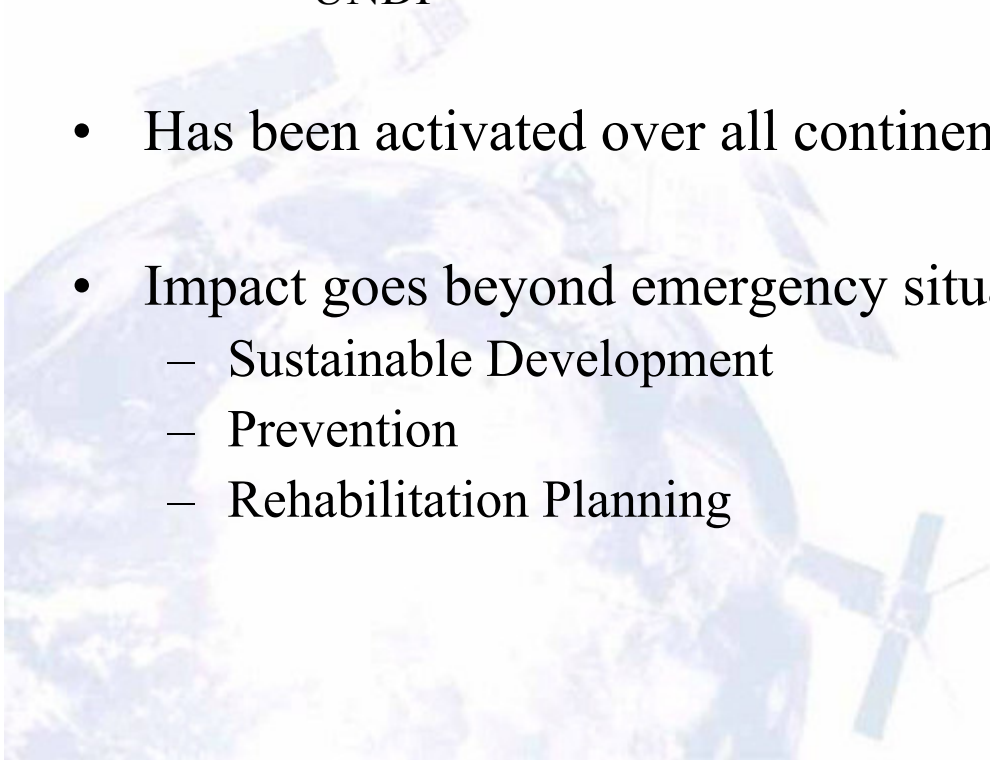
- **DMC and USGS (Mutual training on September 2005)**





# Charter Overview

- Serves:
  - National civil protection, emergency & rescue organizations.
  - Extended to UN specialized agencies through UNOOSA:
    - UNOSAT
    - UNOCHA
    - UNDP
- Has been activated over all continents for a variety of disasters.
- Impact goes beyond emergency situations and can aid in areas such as:
  - Sustainable Development
  - Prevention
  - Rehabilitation Planning





# Charter Operative Sequence



International Charter "Space and Major Disasters" - Activating the Charter - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address http://www.disasterscharter.org/activate\_e.html

real Type search here Search Web Radio Music Games Sports News Movies HotStuff TV/Celebs

**Agencies - Resources**  
**Media Information**  
**Links**  
**Search**  
**Français**

## Sequence of Events

The following illustration depicts the sequence of events that occur once the Charter is activated. Beginning with the authorized user (bottom left), follow the sequence with your mouse for a brief description of each step, and click on any of the steps for more in-depth information.

Sequence of Events

Inicio Mi PC E:\ Eudora Light E:\Hielos\_Continentales Microsoft PowerPoint ... International Char... 10:08



# Charter Activation Cases (regions)



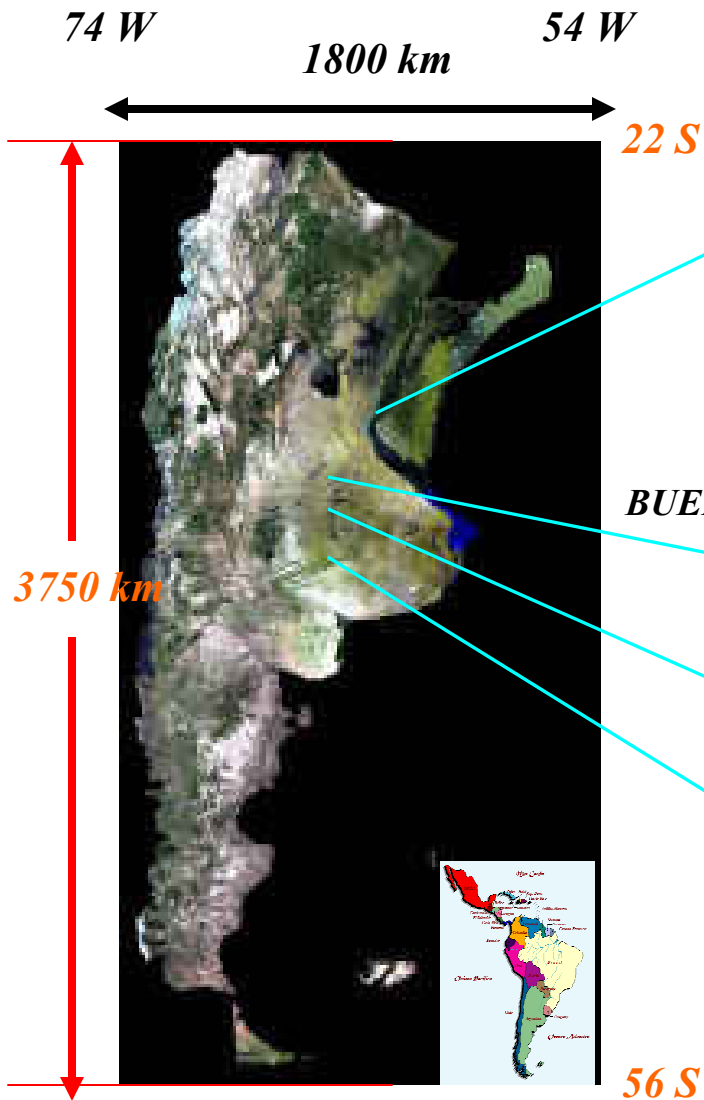
- Rarotonga, Cook Islands
- Earthquake
- Volcanic Eruption
- Landslide
- Flood/ocean wave
- Storm/hurricane
- Oil Spill
- Forest Fire
- Other



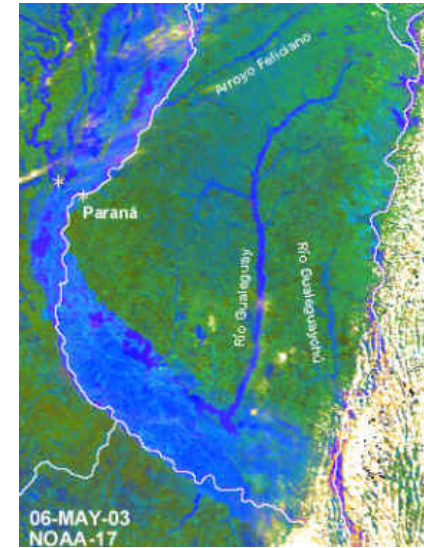
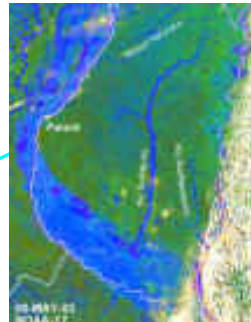
## Why CONAE joins the Charter?



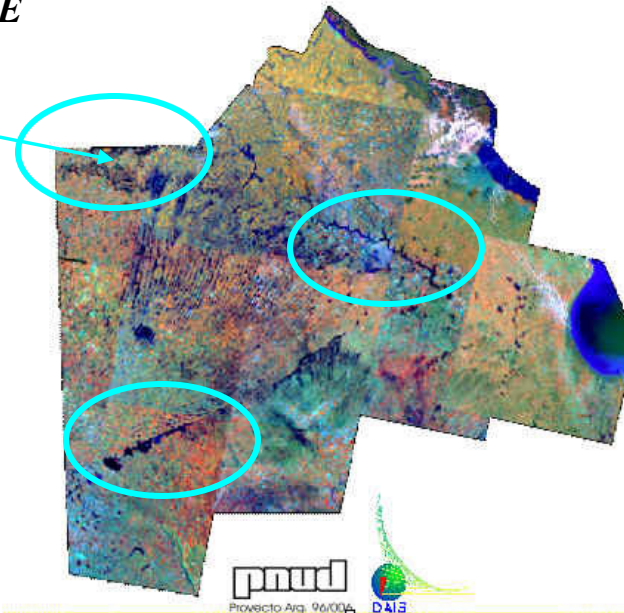
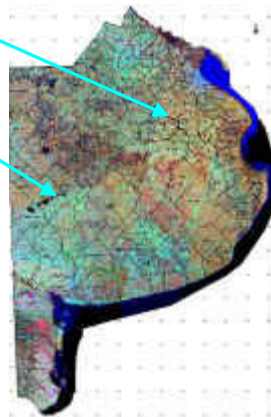
# Frequently flooded regions



*PARANA RIVER*



*BUENOS AIRES PROVINCE*





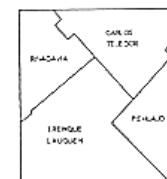
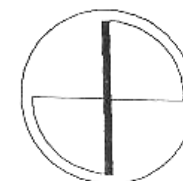
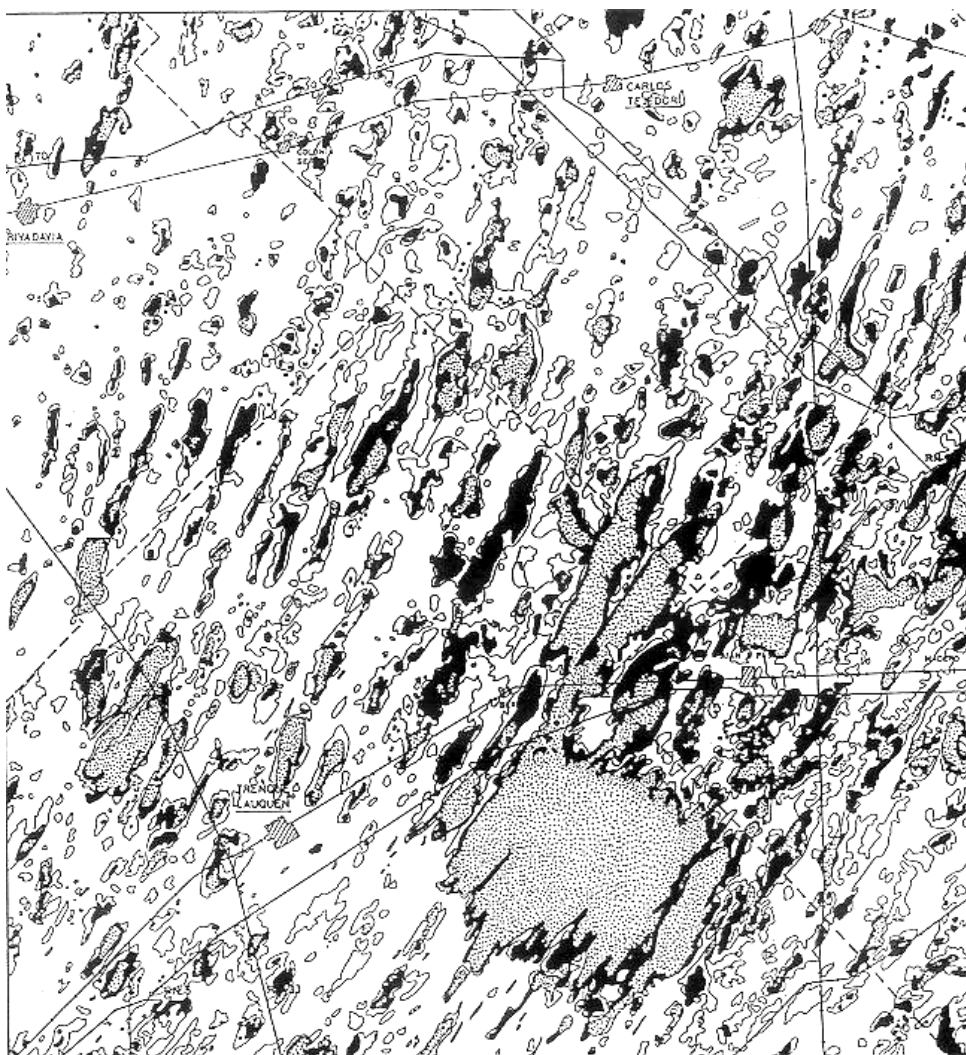
## **Techniques used for flooded area mapping at regional scale in Argentine. (Photogrammetry and RS)**

- **Early Seventy to 1978: Aerial Photogrammetry. Water body delimitation. Area measuring.**
- **1978-1983 Use of Satellite data from Mar Chiquita Antenna (mainly Landsat MSS)**
- **1984-1987 No more antenna, mapping with Landsat data from using film and Zoom-transfer-Scope devices and some digital processing (DEC-VAX based processing software.).**
- **1987-1996 Landsat TM data were acquired at Brazil Ground Station. During this period we map the flooded areas at least one or more months later than the image was acquired. This delay was due mainly to logistic problems.**





# Multitemporal mapping from TM data (1985-1987-1989)

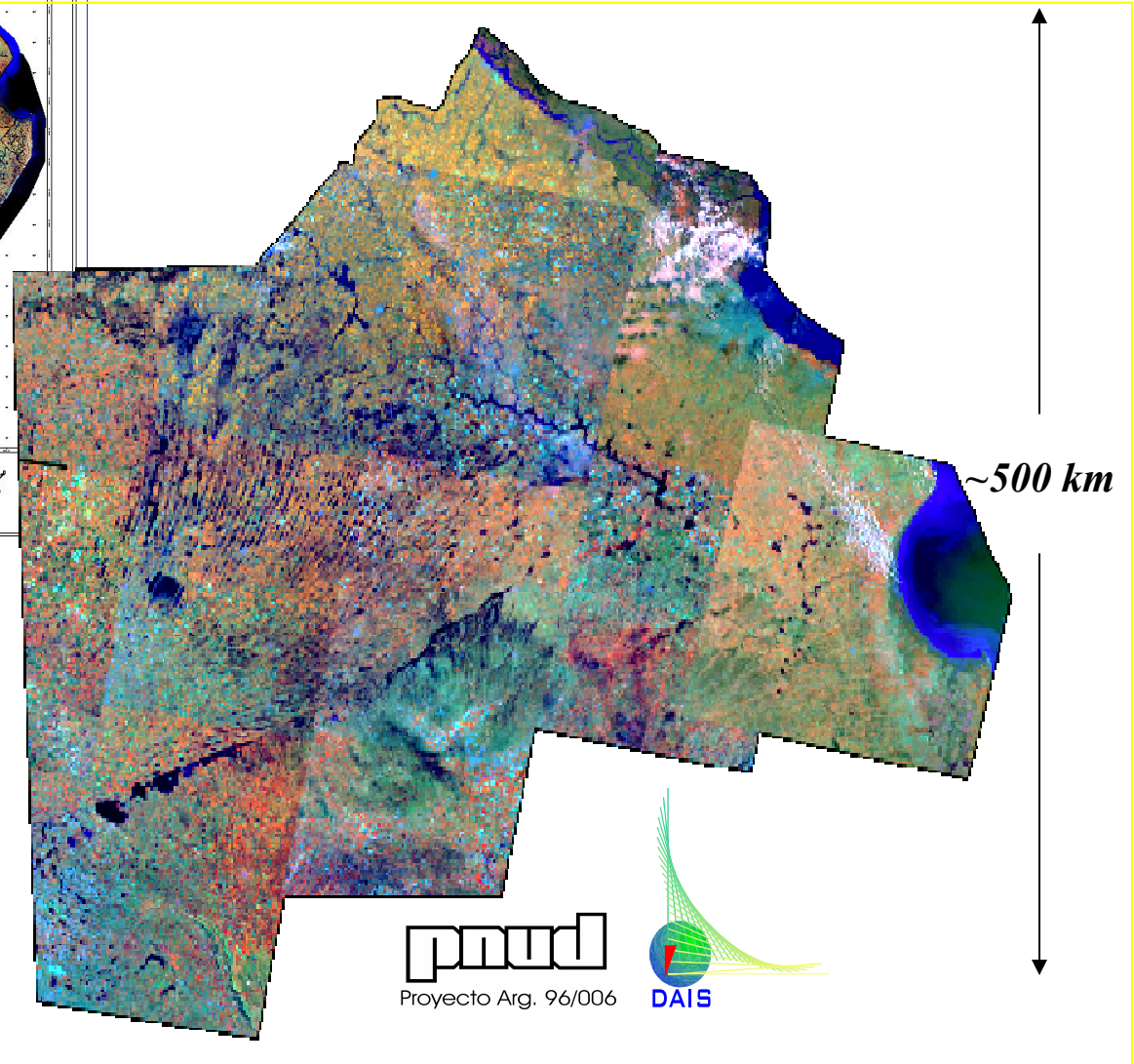
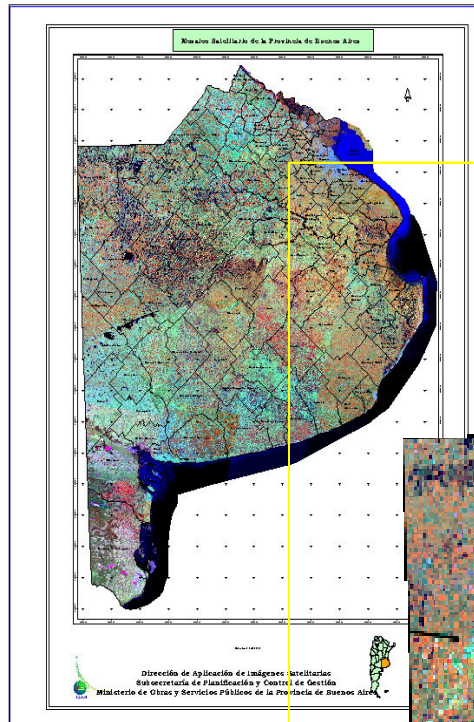


### REFERENCIAS

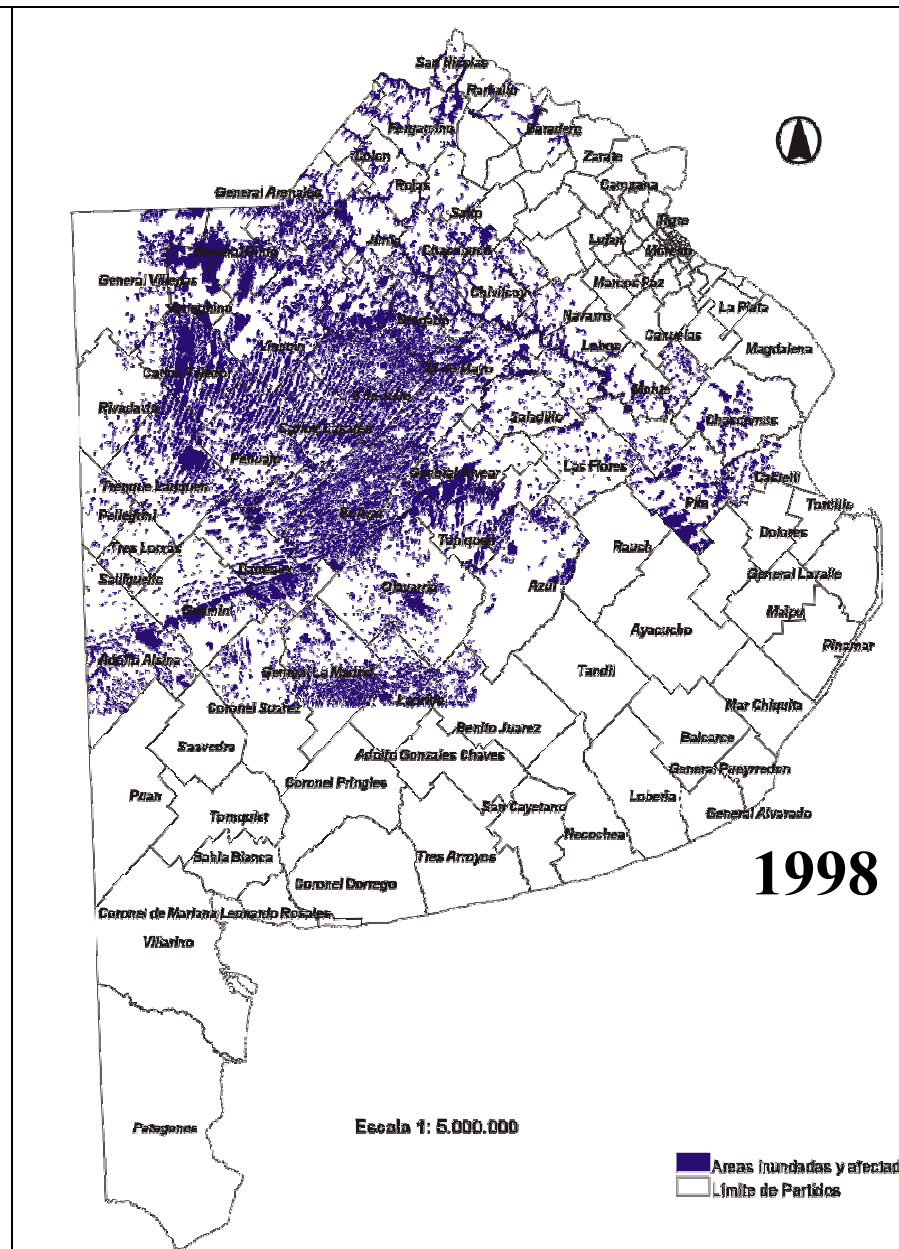
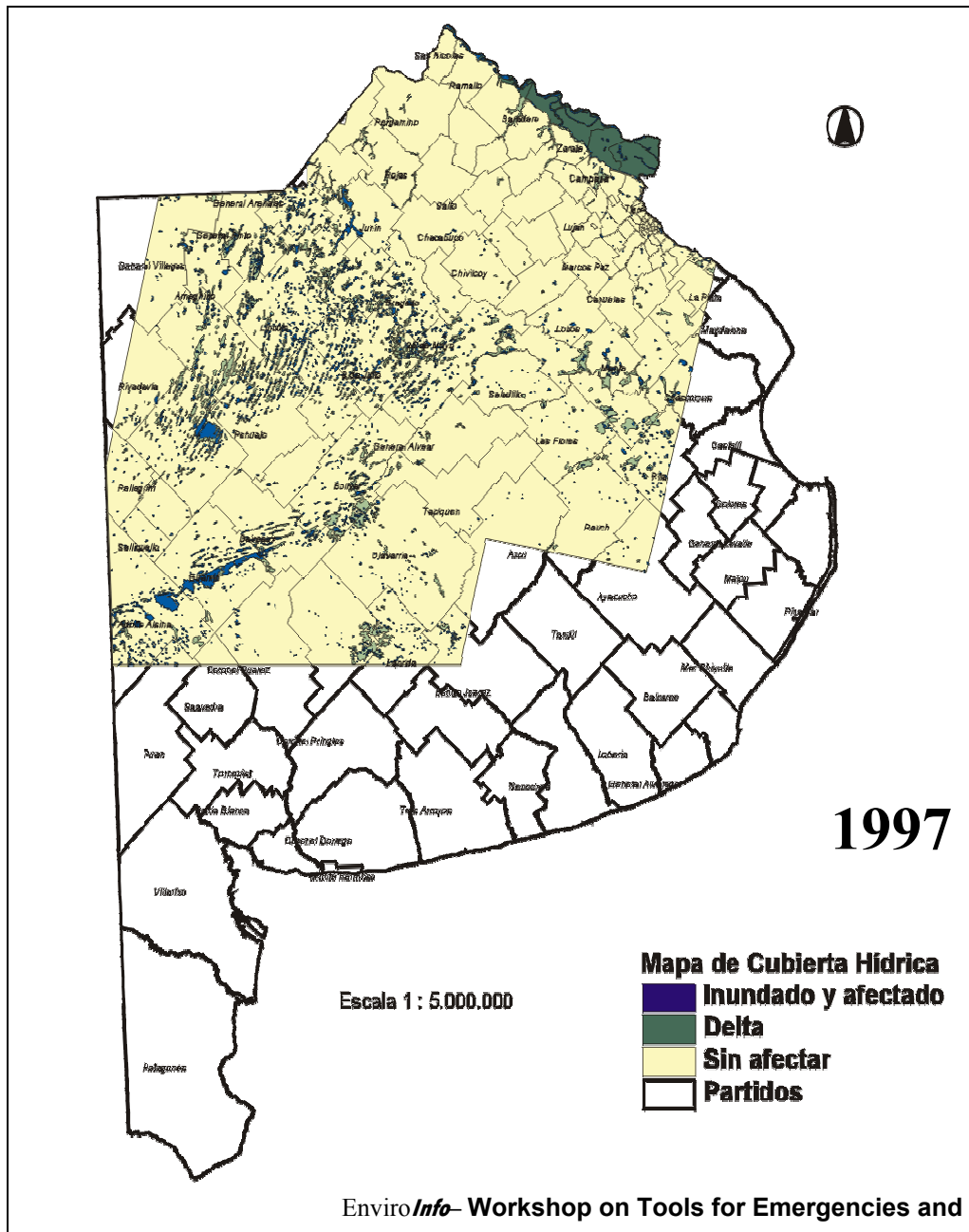
Rutas	—————
Límite de partido	- - - - -
Ferrocarril	—————
Lagunas nov. 87'	~~~~~
Lagunas dic. 85'	—————
Lagunas abr. 89'	~~~~~

ESTUDIO MULTITEMPORAL EN EL NOROESTE DE LA PROVINCIA DE BUENOS AIRES	
DIRECCION DE APLICACION DE AVIACIONES SATELITARIAS	
FECHA DE TOMA: NOV-87-DIC-88-ABR-89	
INTERPRETE: LIC. ANTONIO CARLOS L.	
DIBUJO: ORLANDO GALLINSKI	
ESCALA: 1: 1.250.000	PASAJE: 227-85

# Mosaic of the frequently flooded areas

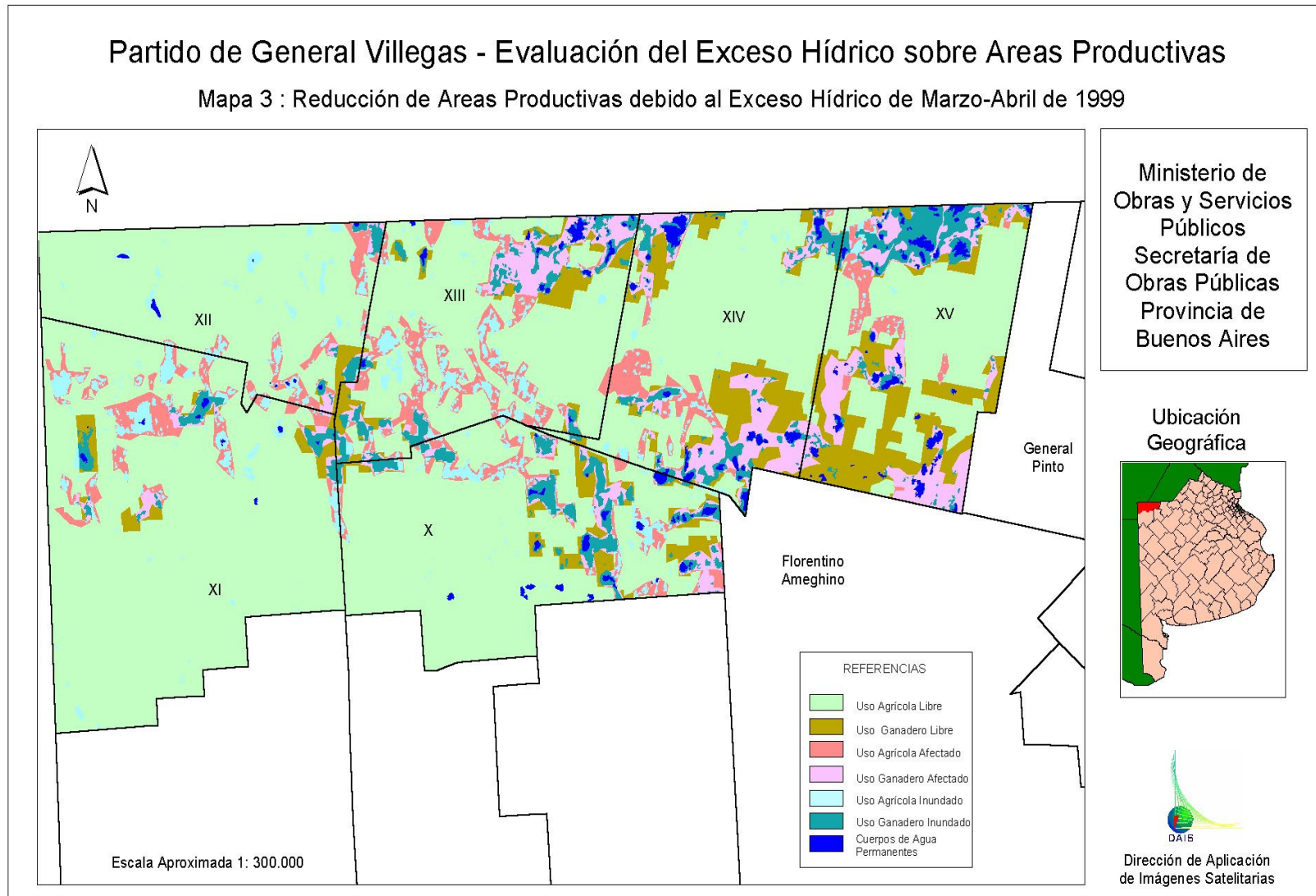


# Creating digital maps for multitemporal analysis

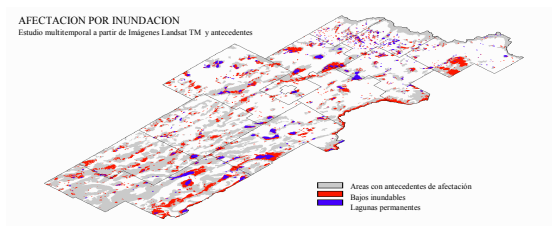
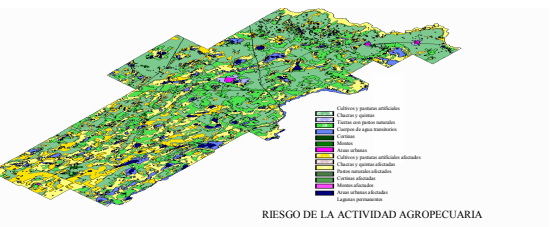
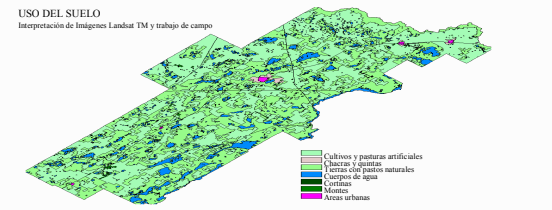
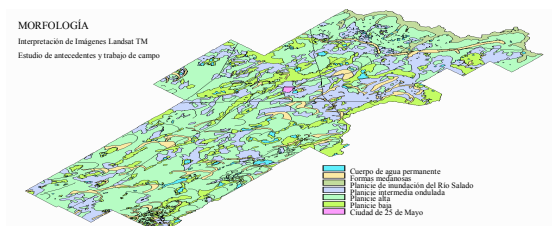
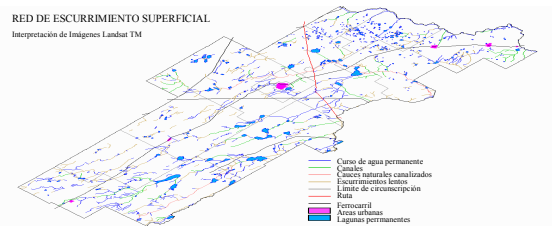
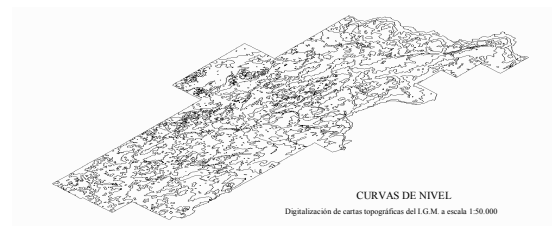
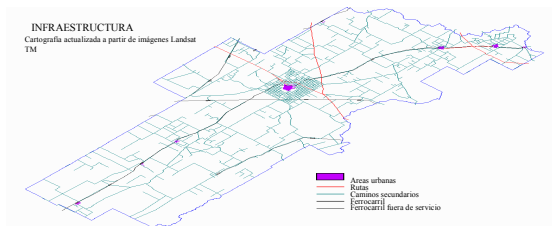




# Since 1992 final products for flood mgmt. in GIS coverages



# Creating flood-risk maps (1993)





## **CONAE Groundstation (1997)**

# CONAE GROUNDSTATION



1996



1996



1998



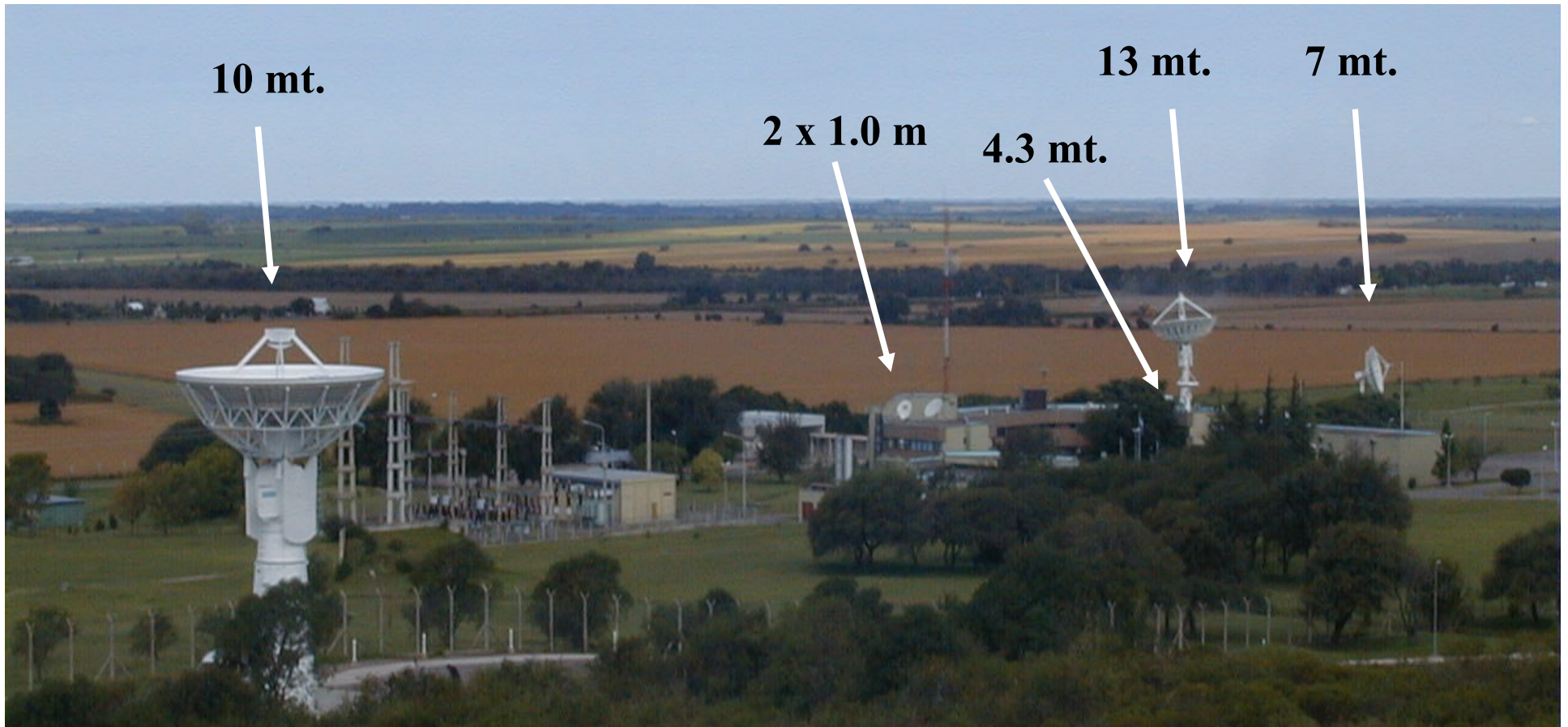
2000







## Actual view of the Córdoba CONAE Groundstation







# SATELLITE DATA RECEIVED



↳ The historical archive starts in 1997 (available data and data acquired now):

- Landsat 5 TM (reception restarted)**
- Landsat 7 ETM+ (stripped images)**
- NOAA 12, 14, 15 y 16 AVHRR**
- OrbView2 SeaWiFS
- ERS 1 SAR (not operat. histor. data)**
- ERS 2 SAR**
- SPOT 1 y 2 HRV (modos P y XS)
- SAC-C**
- TERRA (MODIS)**
- EO-1**
- Radarsat
- EROS-A
- IRS-1 C y D
- BIRD (Historical data)
- AQUA**

(misión tandem de ambos satélites)

↳ Data we want to receive:

- CBERS
- ENVISAT

↳ Data from future missions

- COSMO SKYMED
- SAOCOM
- SAC-D

↳ Data not acquired at the groundstation

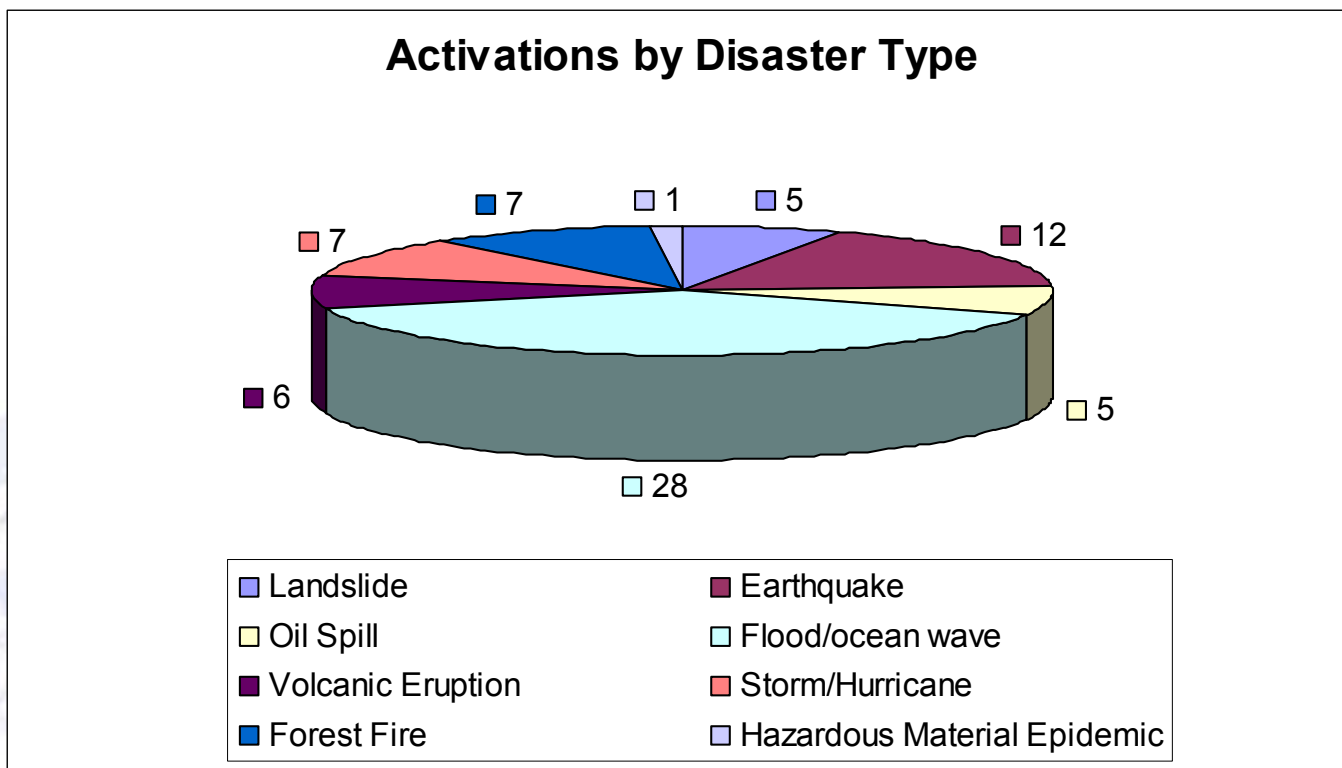
- Landsat 5 MSS y TM  
(historical since 1986)
- DMSP
- AVIRIS (Airborne)



# More details regarding the Charter Activations



# Activations by disaster type



Total Activations	71
Total Activations (Non-Charter Member Countries)	39 (60%)
Activations by UN Authorized User (AU)	14 (22%)

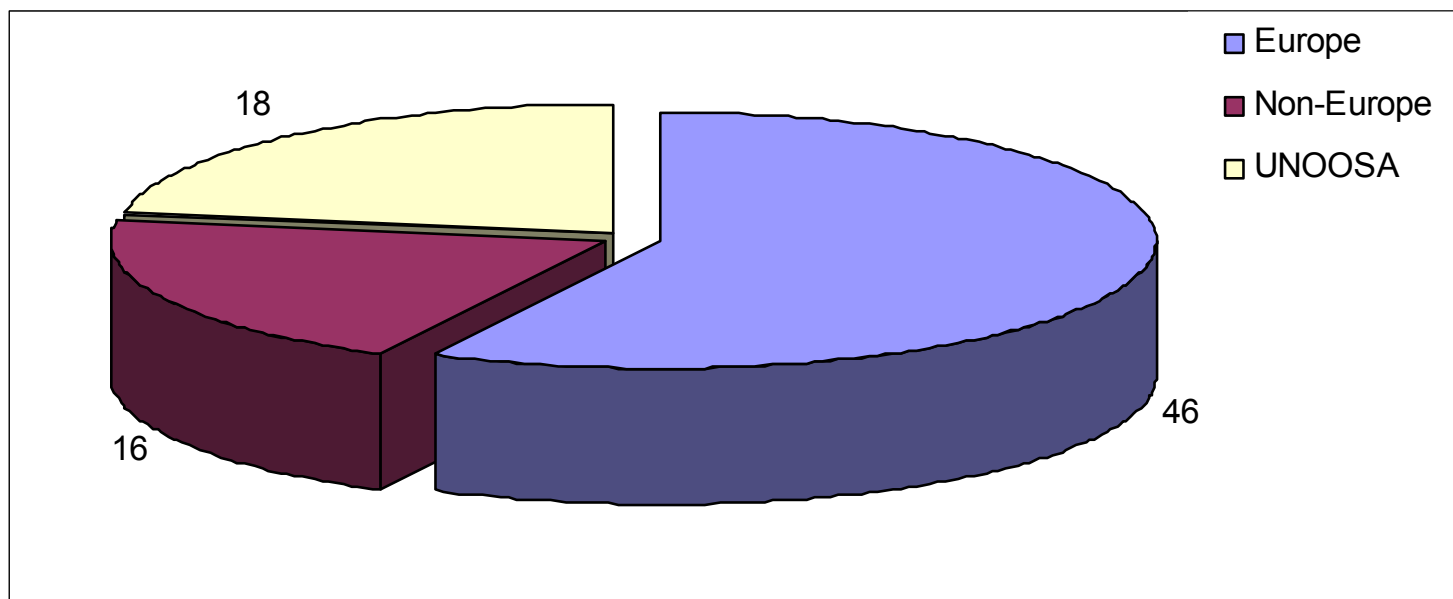


# Charter Calls Since 2000





# Activations by Authorized User Type

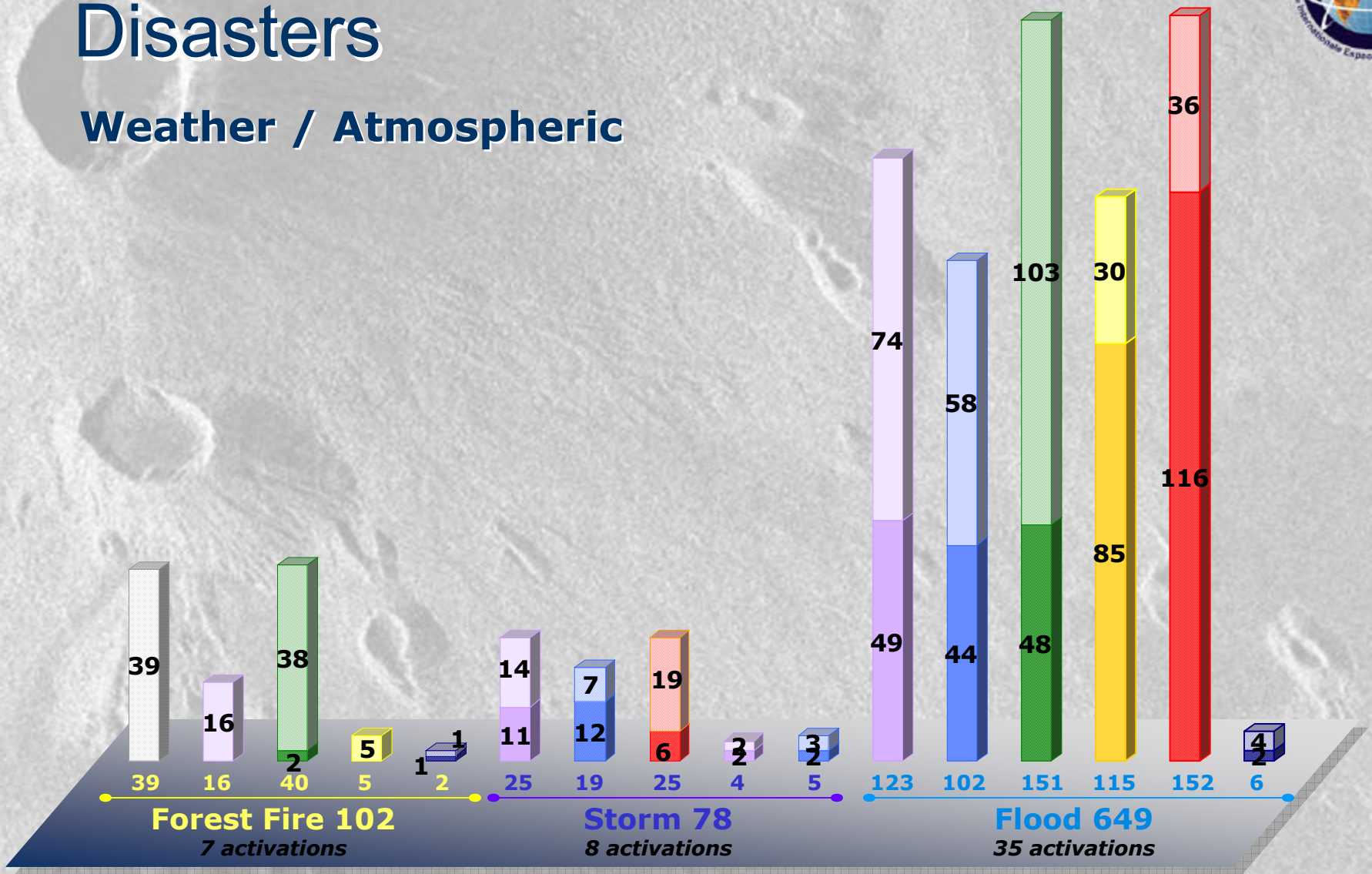


Total Activations	80
Activations by Europe AUs	46 (57.5%)
Activations by Non-Europe Aus	16 (20%)
Activations by UNOOSA	18 (22.5%)

# Data Units Used for Various Disasters



## Weather / Atmospheric



New	New	New	New	New	New	New
POES	ENVISAT	RADARSAT	SPOT	ERS	IRS	SAC-C
Archive	Archive	Archive	Archive	Archive	Archive	Archive





## **The argentine SAC-C Satellite (Nov. 2000)**



November 2000: SAC-C SATELLITE IN ORBIT

# SAC-C: FIRST ARGENTINE SATELLITE FOR EARTH OSERVATION

- MMRS
- HRTC
- HSTC
- GOLPE
- MMP
- IST
- INES
- ICARE
- DCS



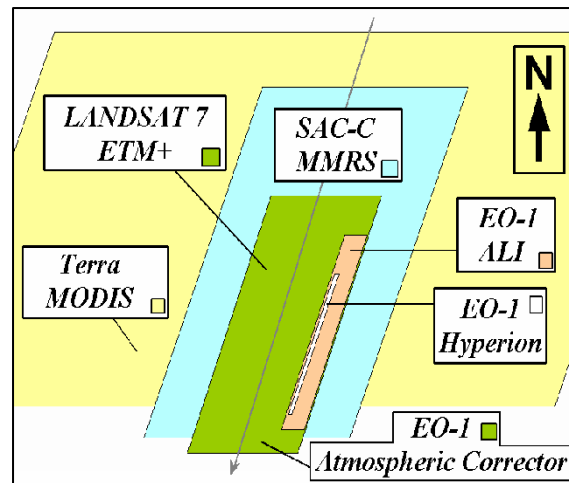
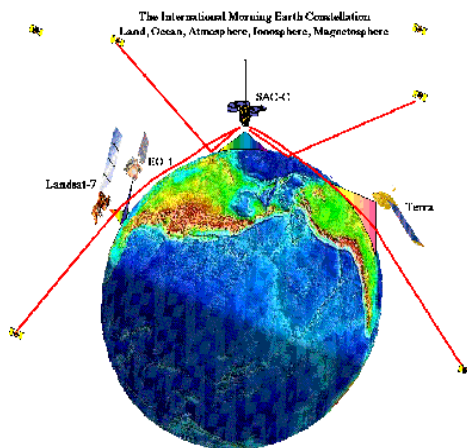
Injected in orbit on november 21th. 2000



# SAC-C in the morning constellation



- Morning Constellation: Following the same track, the four satellites observe the earth with different sensors and a short time difference.



Equat. cross time:

Landsat 7:	10:00
EO 1:	10:01
SAC C:	10:15
TERRA:	10:30



# SAC-C Cameras



## Multispectral Medium Resolution Scanner (MMRS)

175 meters resolution

Five spectral bands:

•Blue: 480-500 nm

•Green: 540-560 nm

•Red: 630-690 nm

•NIR: 795-835 nm.

•MIR: 1.55-1.70 nm.

•High Resolution Technological Camera (HRTC)

•35 meters spatial resolution

•Panchromatic 450-750 nm

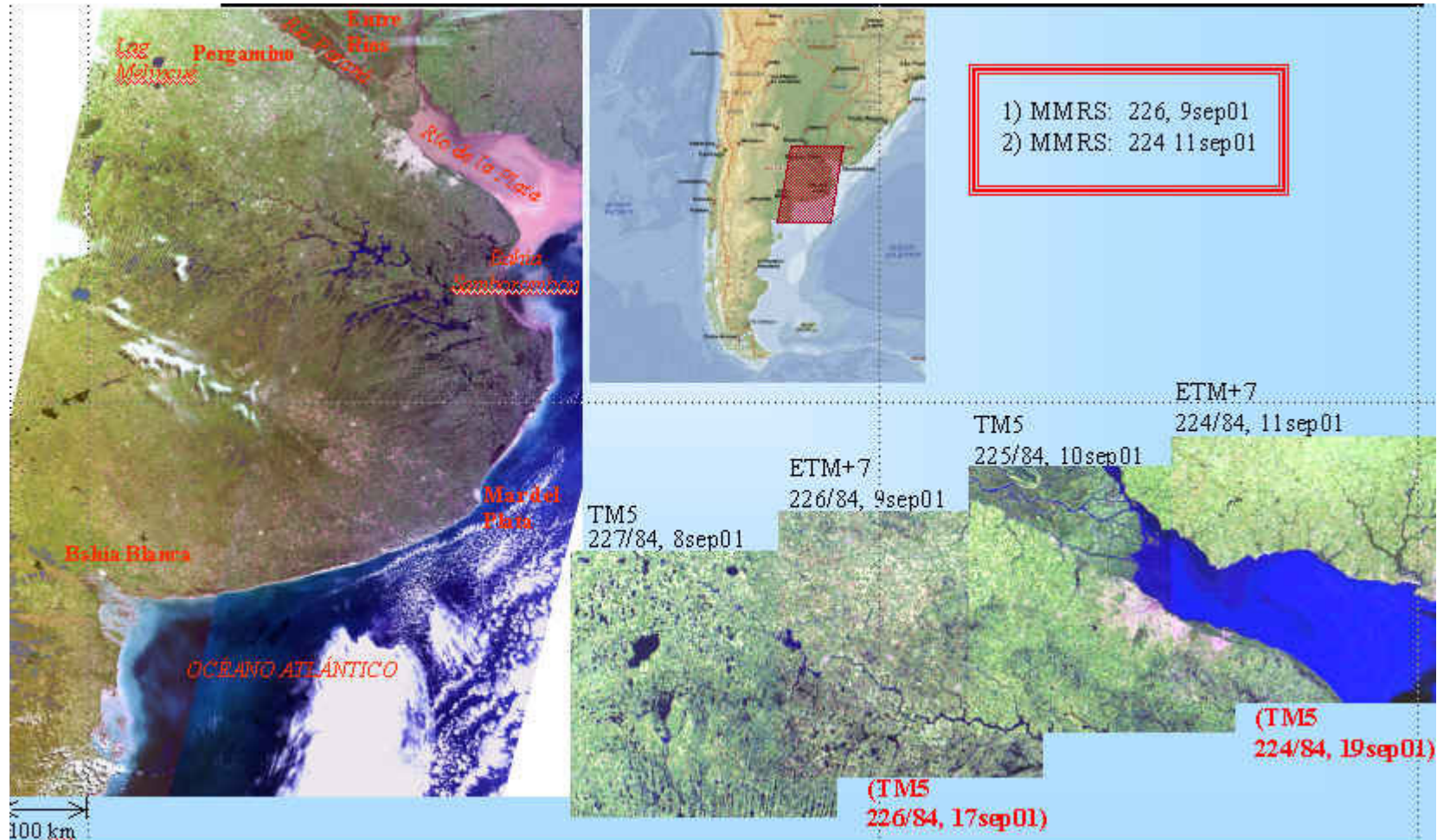
•High Sensitivity Technological Camera (HSTC)

•230 meters spatial resolution, Night images, visible range.

# SAC-C: Flood monitoring over 350 Km. Swath

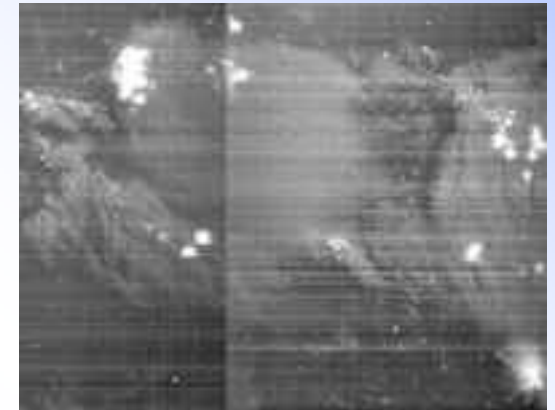
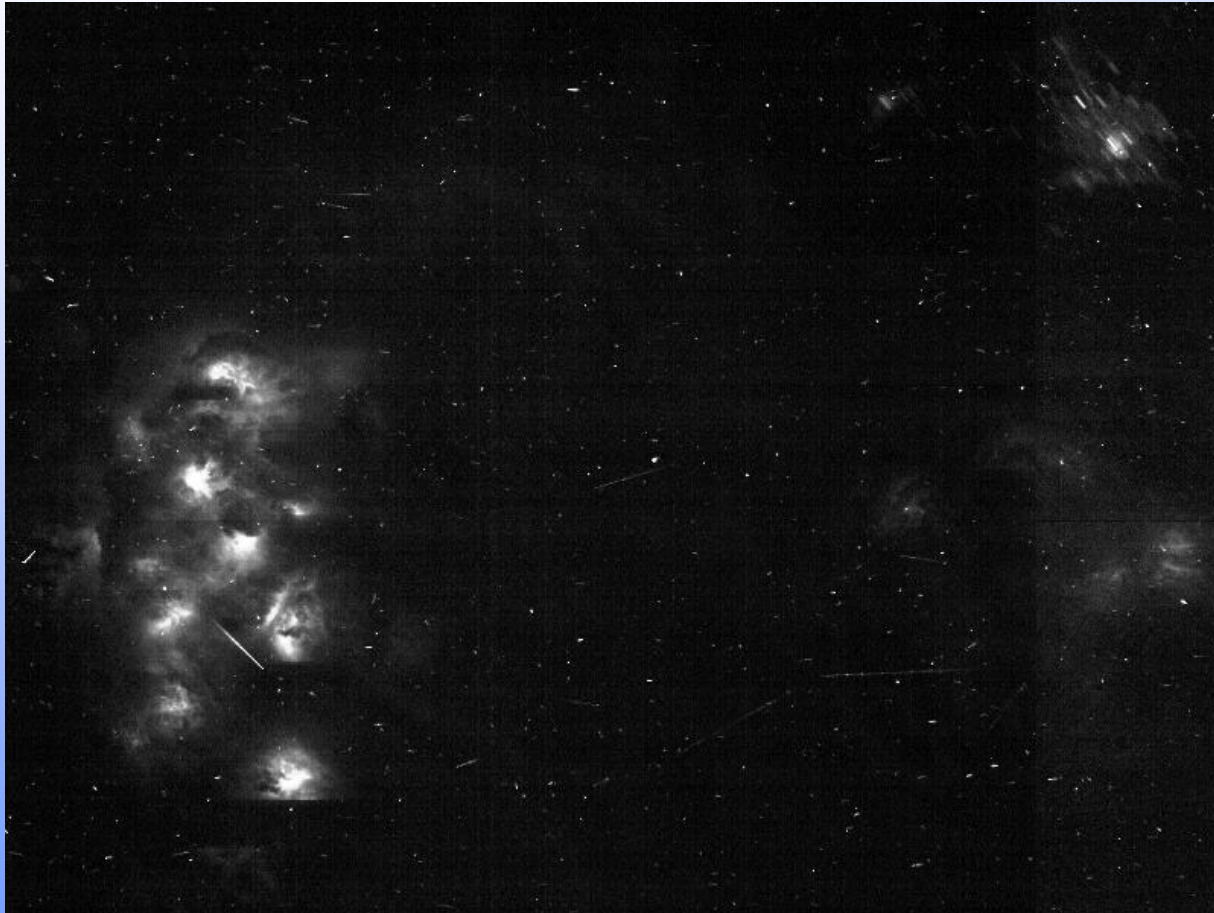
700 Km. TWO MMRS IMAGES

700 Km. FOUR TM IMAGES

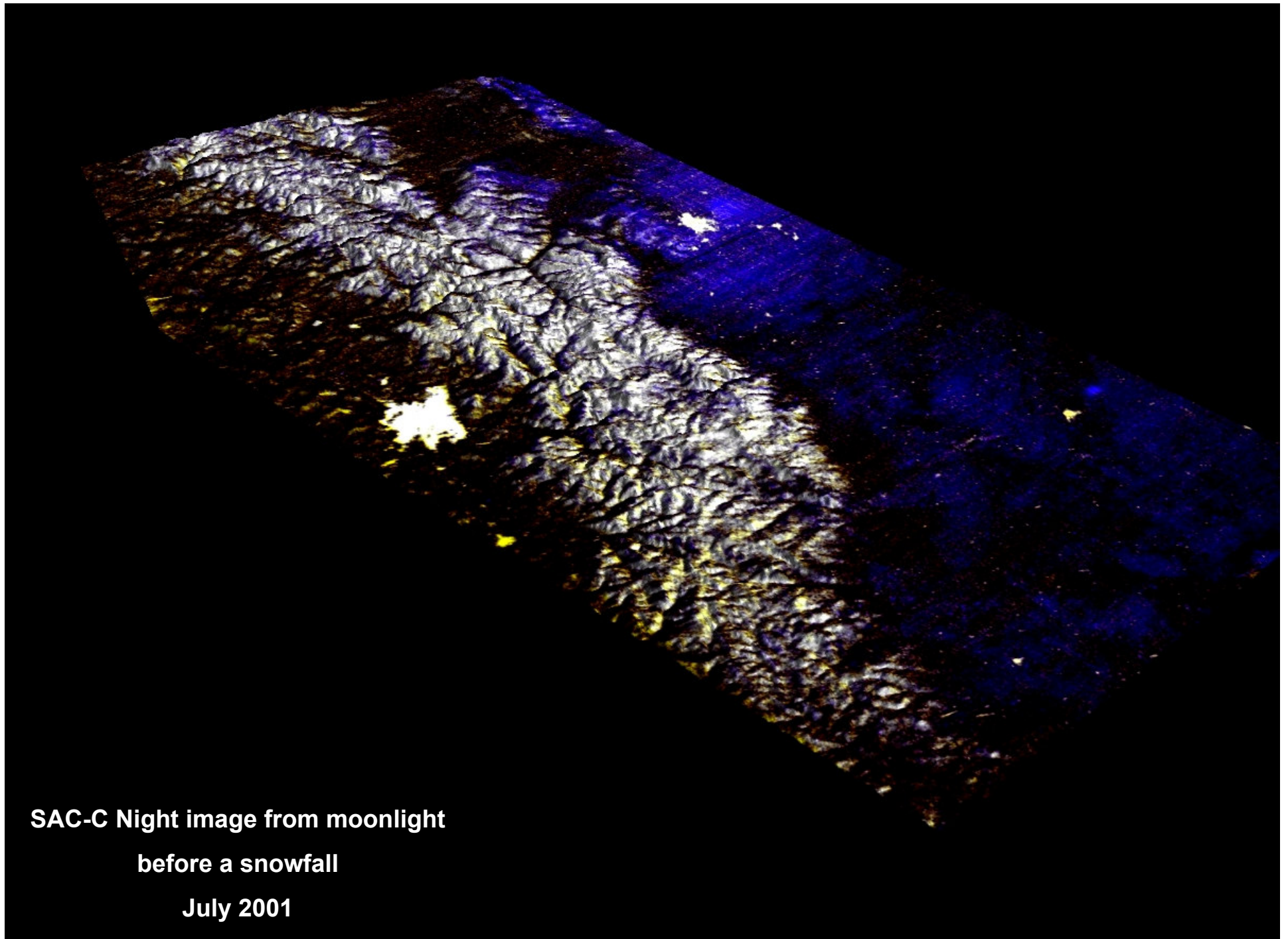




# Lightning Detection with HSTC







**SAC-C Night image from moonlight**

**before a snowfall**

**July 2001**



# ONE EXAMPLE OF A CHARTER ACTIVATION





# Santa Fe Flooding



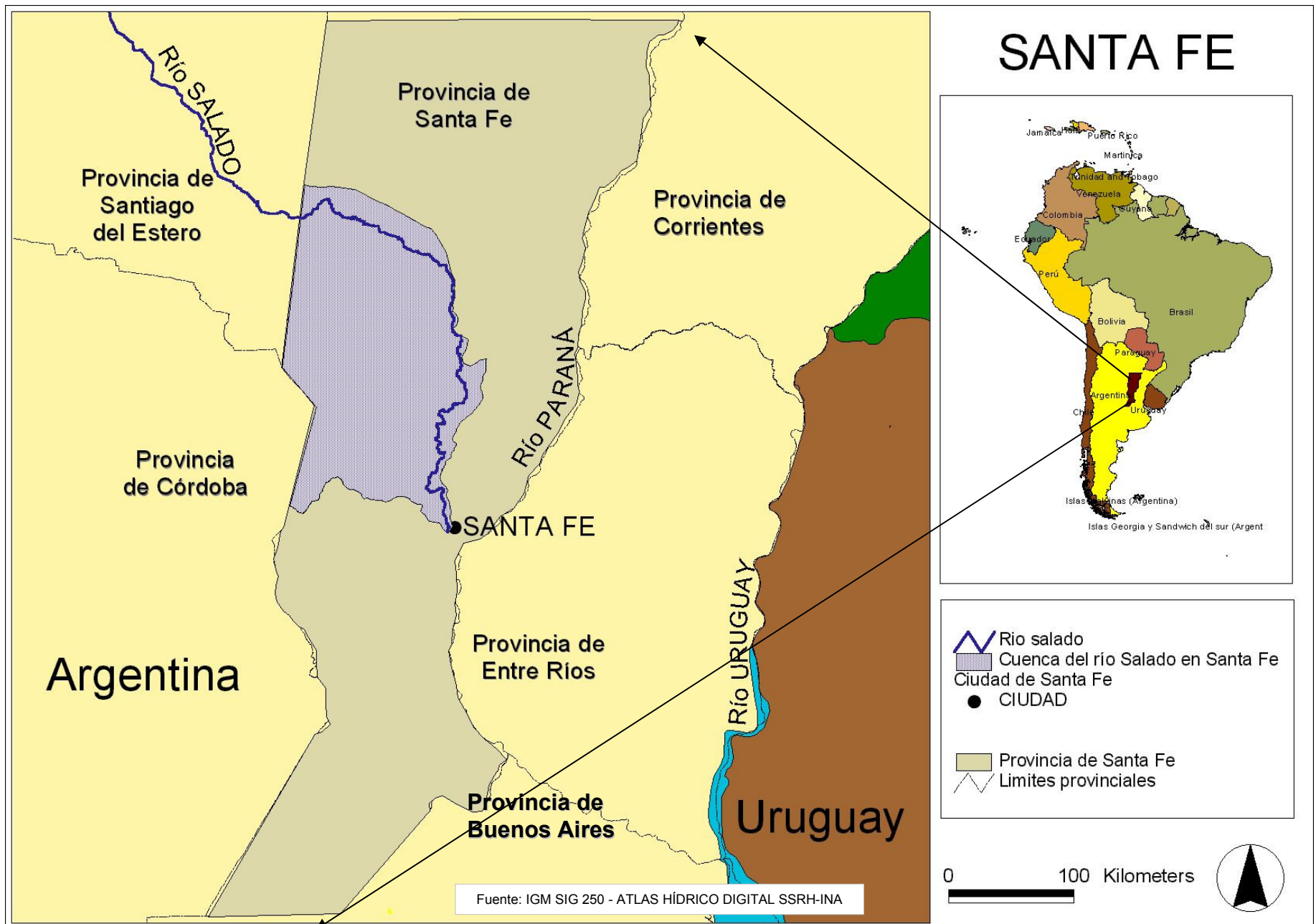
## **NUMBERS OF THE SANTA FE DISASTER**

- **23** person losses.
- **80.000** damnified.
- People disappeared.
- **28.000** damaged houses and buildings.
- Estimated economic losses::  
- **\$ 2.878.000.000 (aprox. U\$S 1.000.000.000)**

(source : UN -CEPAL)

Hydrological Disaster  
In Santa Fe, May 2003:  
***A Satellital Monitoring  
Experience "In Real Time"***

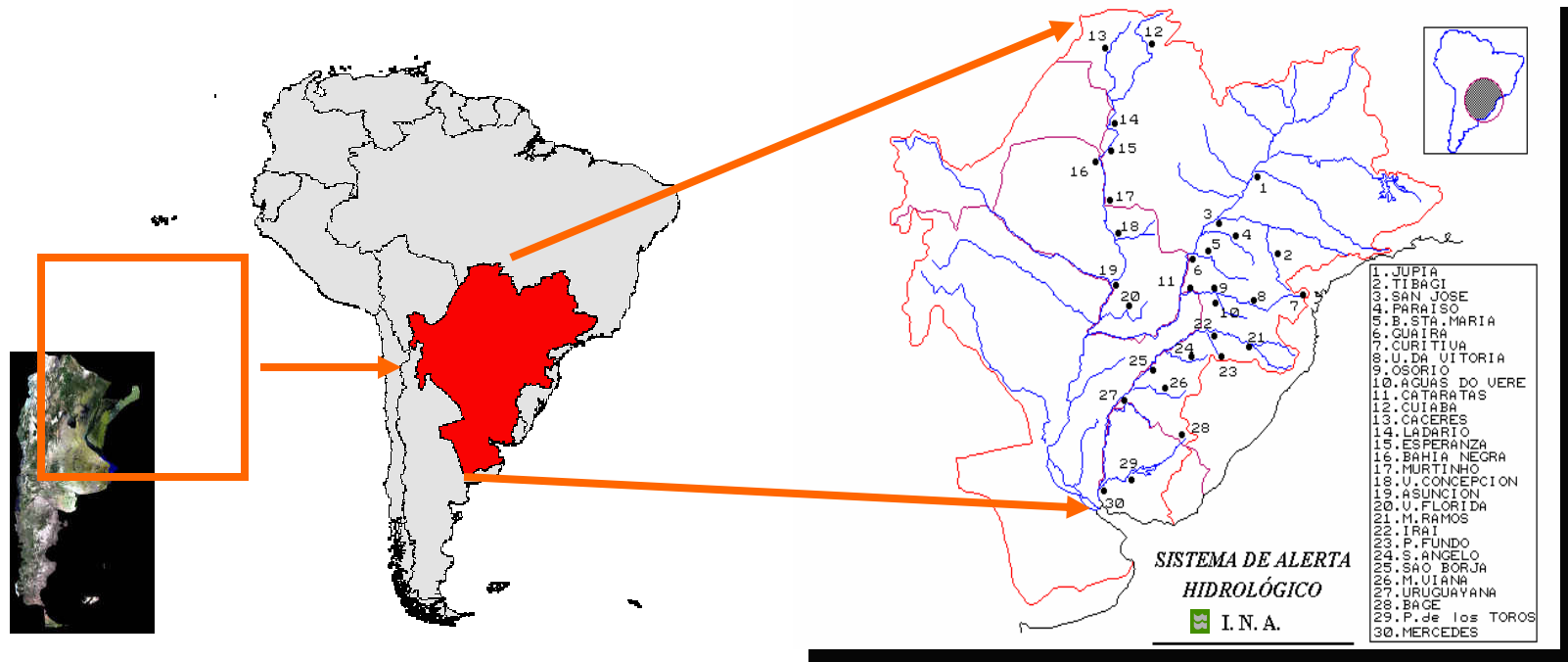
# Geographical location







# Measurements station for the Alert System of the El Plata Basin



**Prevention:** The National Water Institute (INA) works together with the countries that share this basin, using meteorological data, limnigraphs,

**and satellite data.**



# Main features of La Plata Basin



## Description:

*Approximate Extension:*

- $\approx 3.200.000$  km<sup>2</sup>

*5 countries*

- Argentina
- Bolivia
- Brasil
- Paraguay
- Uruguay

*Main Rivers:*

- Paraná, Paraguay, Uruguay, Iguazú, Pilcomayo y Bermejo.

## Economic Relevance:

*Highly populated:*

- $\approx 100.000.000$  people
- Produces the 70% of the global production of the 5 countries.
- More than 40 hydroelectric centrals that satisfy the 60% of the power demand of the region.
- Is partially navigable by barges and ships.
- An Hydroway is under implementation now.



# Salado River Evolution – General view



RÍO SALADO: SUPERPOSICIÓN DE IMÁGENES LANDSAT 7 ETM

■ 15 JUNIO 2002

■ 25 ENERO 2003

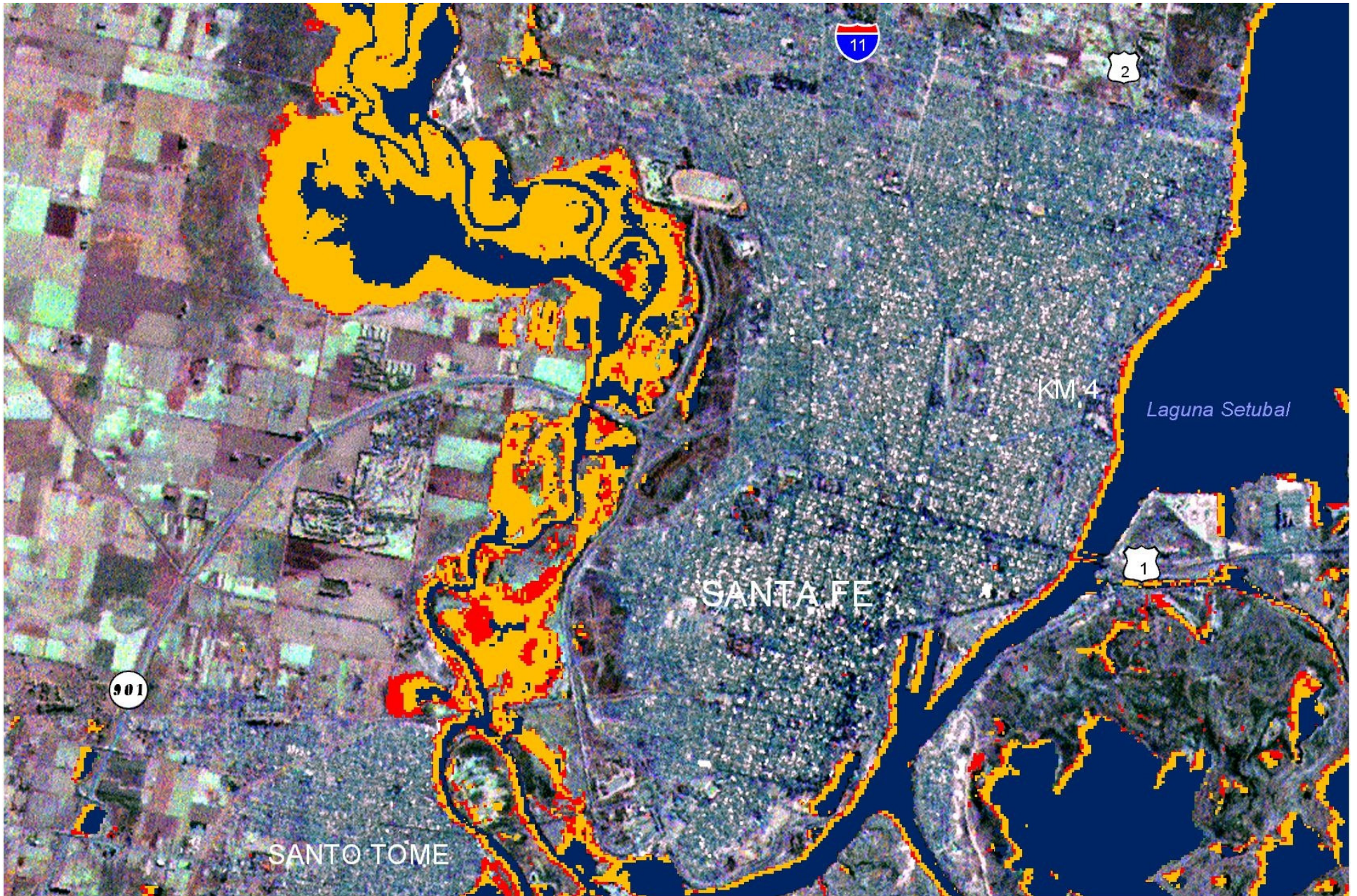
■ 17 ABRIL 2003

1 0 1 Kilometers





# Salado River Evolution – Zoom over the city



RÍO SALADO: SUPERPOSICIÓN DE  
IMÁGENES LANDSAT 7 ETM

■ 15 JUNIO 2002 ■ 25 ENERO 2003 ■ 17 ABRIL 2003

500 0 500 Meters





# SPOT Image from International Charter





# Conclusions

- The Charter has covered disasters in countries of all the continents and has not been restricted only to the states represented by the member agencies.
- The member agencies have regularly exceeded their commitments by providing value-added products.
- The Charter performance is improved by adjusting Charter operational procedures according to the feedback received from the AUs, end users and the PMs.



# Acknowledgements

- To Ahmed Mahmood from CSA.
- To Gustavo Calvanese from DAIS/PNUD for the material on Buenos Aires Province.
- To Felipe Pasquevich, form CONAE.
- To Monica Castro.
- To Alvaro Soldano from the National Water Institute.





## The Charter web-site is available for information and suggestions

[www.disasterscharter.org](http://www.disasterscharter.org)

Thank you !