BRAZILIAN ENVIRONMENTAL DATA COLLECTION SYSTEM

MINISTÉRIO DA CIÊNCIA E TECNOLOGIA

BRAZILIAN SPACE-BASED ENVIRONMENTAL DATA COLLECTION SYSTEM

GEO Capacity Building Workshop
29-31 May 2006. SJCampos, Brazil
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System Description

Main applications:
- Hydrological basins monitoring
- Weather and climate forecast
- Chemistry of the atmosphere
- Oceanography

Data Collection Platforms (DCP):
- More than 700 DCPs installed

Satellites:
- SCD-1 (Operational since 1993),
- SCD-2 (Operational since 1998),
- CBERS-2 (DCS turned off, 2005)

System Users:
- More than 100 organizations
Data Collection System characteristics

• **Capacity of the System:**
  500 DCPs/Channel in the satellite footprint
  2 channels (401.62MHz and 401.65 MHz)
• **DCS transponder retransmits the received DCP messages in S Band or UHF (CBERS-2)**
• **DCP message acquisition is done at the Receiving Stations using a Data Collection Processor**
• **DCP message processing and storage are done at Data Collection Mission Center located in Cachoeira Paulista.**
• **Users can access the data at most 30 min after the satellite pass over a receiving station by Internet (ftp)**
• **DCP location capability using Doppler shift measurements at receiving station**
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DOPPLER SHIFT DCP LOCATION CAPABILITY

32339 Moored Buoy

<table>
<thead>
<tr>
<th>Longitude (W)</th>
<th>-22.0</th>
<th>-22.5</th>
<th>-23.0</th>
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<tbody>
<tr>
<td>Latitude (S)</td>
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Space Segment
SCD-1, SCD-2 e CBERS-2
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DATA COLLECTION MISSION CENTER
SCD/CPTEC - Cachoeira Paulista
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CUIABÁ GROUND STATION
DCS Receiving Station in Brazil
Satellite passes over Cuiabá Station
DCP NETWORK IN THE SYSTEM

NUMBER OF DCPs

YEAR

Atualizado: Abril 2006
DCP DISTRIBUTION - April / 2006
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DCP APPLICATION PERCENT DISTRIBUTION

- HYDROLOGY: 53.3%
- METEOROLOGY: 32.8%
- WATER QUALITY: 1.8%
- ANEMOGRAPH: 1.3%
- OCEANOGRAPHY: 8.1%
- TIDE STUDIES: 1.0%
- SPECIAL: 0.3%
- LOCALIZER: 0.2%

TOTAL INSTALLED DCP SINCE 1993: 728

Atualizado: Abril / 2006
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DCP APPLICATIONS

AWS Ilha Joinville, WMO 89253, Source: Alberto Setzer
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DATA COLLECTION PLATFORM (DCP)

HYDROLOGICAL DCP INSTALLED AT XAVANTINA [SIVAM]  DCP UNDER EVALUATION AT CACHOEIRA PAULISTA
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METEOROLOGY

• Accumulated precipitation (rain gauge)
• Relative Humidity
• Accumulated Solar radiation
• Air Temperature (maximum and minimum)
• Wind Direction and Velocity
• Maximum Wind Intensity and direction
• Barometric pressure
HYDROLOGY

• Precipitation (Rain gauge)
• Atmospheric pressure
• Submersible pressure transducer
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HIDROLOGY: Example of a portable station

- Water level from pressure sensor
- Air intake (pressure compensation)
- LR20 batteries - Autonomy >1 year
- Installed in >2 hours

Evolution: water quality multi-sensor probe, T-S, pH, turbidity

Source: CLS presentation
WATER QUALITY APPLICATION

- pH
- Turbidity
- Dissolved Oxygen
- Salinity/Conductivity
- Solids
- Water temperature
Oceanography applications

Moored Buoys

Drifters

Source: CLS presentation
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PIRATA Project
(Pilot Research Moored Array in the Tropical Atlantic)
Other applications

Tide studies
Anemograph
Chemistry of the atmosphere (CO2)
Environmental Monitoring
Localizer
Engineering tests
POTENTIAL APPLICATIONS IN BRAZIL USING THE BRAZILIAN ENVIRONMENTAL DATA COLLECTION SYSTEM
Wildlife tracking
Vessel Monitoring System using Argos
Source: CLS presentation

Catch per country (Mt)

- China: Argos approved
- Peru: No regulation
- USA: Argos not approved
- Japan: Argos approved
- Indonesia: Argos approved
- Chile: Argos approved
- India: Argos approved
- Russian Fed: Argos approved
- Thailand: Argos approved
- Norway: Argos approved
- Korea Rep: Argos approved
- Iceland: Argos approved
- Philippines: Argos approved
- Denmark: Argos approved
- Viet Nam: Argos approved
Several countries in the world is using the ARGOS System (Russia, Peru, Japan, USA, Panama, Mexico, Venezuela, Honduras, Chile, Guatemala)

In Brazil, SEAP (Fishing and Aquiculture Special Secretary) is establishing fishing rules to monitor for 2000 to 3000 fishing vessels (initial phase) and in following phase additional 5000 vessels.

Source: NOAA presentation
Other ongoing activities to improve Brazilian Environmental Data Collection System

• Improvements in the RF chains of Cuiaba and Alcântara stations.
• 2 new data processing equipment (PROCOD-2) delivered to Cuiabá and Alcântara Ground Stations. One Procod-2 will be installed in Natal.
• Improvements in Data Collection Mission Center processing facilities to reduce data delivery time to the users.
• Development of a new data processing equipment (PROCOD-3).
• Low cost S band receiving station.
• Studies and implementations of the localization algorithms using Doppler effect considering several satellites and several receiving stations as well as signal delay propagation due to troposphere and ionosphere.
• Testing new system applications such as animal tracking using low power transmitters.
Data Exchange with CNES/CLS

• Brazilian DCPs are compatible with the Argos System (NOAA-CNES)

• Argos DCP messages retransmitted by Brazilian DCS and received at Cuiabá Station are being transferred to CLS Argos since 2001

• The Data Exchange agreement is under discussion.
Hydrological and Environmental Data Collection System for Mozambique based on Brazilian Satellites

• Brazil and Mozambique cooperation (MOU signed end of 2002) resulted from discussions with the Community of Portuguese Language Countries (CPLP) and UNESCO.

• Participating institutions: MCT/Brazil, MCT/Mozambique, INPE, MRE, UNESCO, DNA, INAM, UEM

• Implementation in two phases:

First phase: Installation of 4 Hydrological DCPs in Zambeze river basin and a Receiving Station in Beira

Second phase: Installation of an additional 12 DCPs (Meteorological and Hydrological DCP), including water quality sensors and a buoy for oceanography studies
Receiving Station coverage at Beira, Mozambique
FUTURE PLANS

• TO ASSURE THE SYSTEM CONTINUITY BY:
  ➢ DCS PAYLOADS ON CBERS-2B, CBERS-3 AND 4 SATELLITES
  ➢ SMALL DCS SATELLITES FOR SCD-1 AND 2 REPLACEMENT
  ➢ USE OF SCIENTIFIC SATELLITES TO CARRY DCS TRANSPONDERS.

• INCREASE SYSTEM PERFORMANCE AND COVERAGE BY:
  ➢ ADDING NEW RECEIVING STATIONS
  ➢ DEVELOP NEW EQUIPMENTS AND FUNCTIONALITIES

• INCREASE NUMBER OF USERS AND APPLICATIONS
• INCREASE COOPERATION WITH OTHER SPACE AGENCIES
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CONTINUITY

• EQUARS (20º inclination, 750 km, 2007).
• Preliminary proposal for SCD replacement, TBD).
• SSR-1 (TBD).
• CBERS-2B (Polar Orbit, 778 km, 2007).
• CBERS-3 (Polar Orbit, 778 km, 2008).
• CBERS-4 (Polar Orbit, 778 km, 2010).
• SSR-2 (MAPSAR) (Polar Orbit, 606 km, 2011).