



# APSCO

ASIA-PACIFIC SPACE COOPERATION ORGANIZATION

**APSCO activities on space-based disaster risk management**  
**United Nations International Conference on Space-based Technologies**  
**23rd-25th October, 2013**



**APSCO**  
ASIA-PACIFIC SPACE COOPERATION ORGANIZATION

- ***APSCO Activities***
- ***APSCO Applied High Resolution Satellite Project***
- ***APSCO Data Sharing Service Platform and Its Application Pilot Projects***
- ***Support on the Disaster Assessment to APSCO Member States***



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# ***APSCO Activities***



## *Cooperative activities in APSCO*

Areas	Project	Current Status
Space Technology	APSCO Applied High Resolution Satellite Project (APRS)	Preparation for Implementation
	APSCO Geo-Telecommunication Satellite and its Application	Feasibility Study
	Electromagnetic Satellite Payload for Earthquake Prediction	Feasibility Study
Space Science	Development of Asia-Pacific Ground-Based Optical Space Objects Observation System (APOSOS)	Implementation Phase
	Research on Atmospheric Effects on – Ka Band Rain Attenuation Modeling and – Ionospheric Modeling through Study of Radio Wave Propagation and Solar Activity	Preparation for Implementation
	Research on Determining Precursor Ionospheric Signatures of Earthquakes by Ground Based Ionospheric Sounding	Preparation for Implementation
Space Application	Data Sharing Service Platform and Its Application Pilot Project	Implementation Phase
	Applications of Compatible Navigation Terminal System	Implementation Phase
Training	Establishment of the Education and Training Center of APSCO	Implementation Phase
	APSCO Small Student Satellites joint development among Universities of MS	Feasibility Study



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# ***APSCO Applied High Resolution Satellite (APRS) Project***





### Objective:

- Design and Implementation of the project should maximally use the satellite capability equipped with high resolution sensors to meet as much as possible the application needs of Member States.
- Besides, the project should also focus on following aspects:
  - Ground segment interoperability among Member States
  - Auxiliary and experimental payloads from Member States
  - Cost effective solution

Primary payloads:

Panchromatic Imager/ Multispectral Imager (Pan/MSI)+ Wide Field Imager (WFI)

Optional Payloads: Hyper-spectral Imager (HSI)



## Feasibility Study – Key Specification (1)

Key Spec	System Requirements
Designed Life Time	≥ 5 years
Orbit	SSO , Descending node 10:30AM
Satellite Stability	3 Axes
Payloads Configuration	<div><div>Panchromatic:</div><div>GSD: 2m Bands: 450-900nm (RGB+NIR) Swath: 60Km</div><div>Multispectral:</div><div>GSD: 8m Bands: Blue: 450-520nm Green: 520-590nm Red: 630-690nm NIR: 770-890nm Swath: 60Km</div></div>



## Feasibility Study – Key Specification (2)

Key Spec	System Requirements
	Wide Spectrum Imager: GSD: 16m Bands: RGB+NIR Swath: 700Km Hyper spectrum Imager (Optional) : GSD: 30m Bands: 450-2500nm ( $\geq 100$ bands) Swath : 60Km
Dynamic	10bits/Pixel
Revisit Time	$\leq 4$ Days
Continuous Imaging Capability	7000Km
Attitude and Orbit Control	Pointing Accuracy 0.015 deg Stability: 0.003deg/s Slew Rate: $\pm 35$ deg/45s
Maneuver	$\pm 35$ deg
Data Transmission and Control	Data rate 190*2Mbps, X band, G/T:31dB/K TT&C, S band





### Ground Facilities Definition

One Prime Ground Control Station and One Back-up Ground Control station (functionally identical) as well as One Receiving Station with processing, archiving, administration and distribution facilities shall be included in the project.





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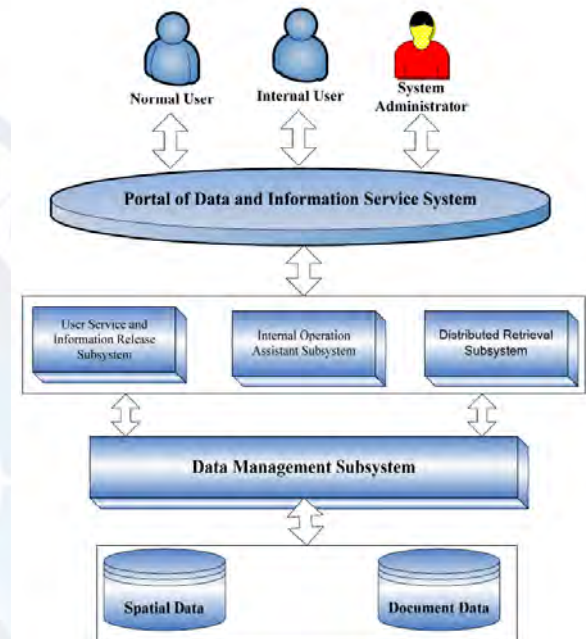
# ***APSCO Data Sharing Service Platform and Its Application Pilot Project***



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## *DSSP and its Application Pilot Projects*

The data sharing service platform (DSSP) has been established in May, 2012. It provides full service of the space applications and space technology to maximize the effectiveness to meet the demand of different levels of users from the Member States and regional users etc.





## *DSSP and its Application Pilot Projects*

### Available Data:

Satellite	Status	Data Type
GF-1	Launched in April, 2013	Pan: 2m MS: 8m, 16m
GF-2	Plan to be launched at the end of 2013	Has not published
HJ-1A/1B	Launched in 2008	CCD: 30m Hyper spectral: 100m (not available) Infrared: 300m (not available)
ZY-1 02C	Launched in 2011	Pan: 5m MS: 10m
ZY-3	Launched in 2012	Pan: 2.8m-5m MS: 6m
SJ-9	In orbit testing	Has not published
CBERS-03	Plan to be launched at the end of 2013	Has not published
FY satellites	Operating	Meteorological Data





## *DSSP and its Application Pilot Projects*

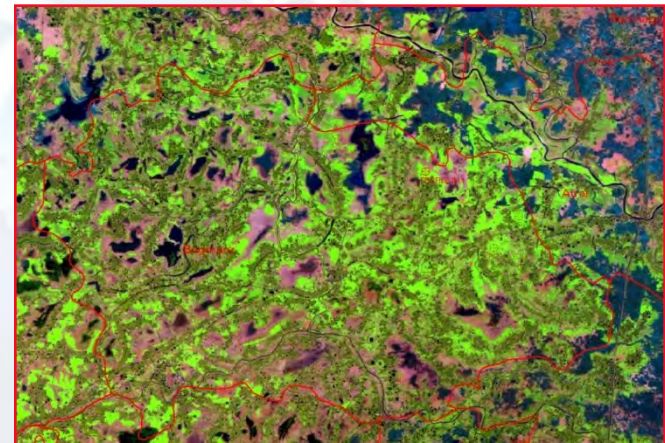
Based on the DSSP, proposals on application pilot project from Member States were invited and evaluated. 4 proposals were chosen to demonstrate the DSSP applications:

- (1) Evaluation of Different Remote Sensing Techniques for Drought Study (Pakistan);
- (2) Strengthening of Satellite Based Crop Monitoring and Estimation System for Food Security Application in Bangladesh (Bangladesh);
- (3) Estimation of Rice Field using Multiple Satellite Sensors (Thailand);
- (4) Remote Sensing Monitoring of Dust and its Applicative Demonstration in the Arid and Semi-arid Areas (China).





## Pilot Project 1 - Strengthening of Satellite Based Crop Monitoring & Estimation System for Food Security Application in Bangladesh





### Objective:

- Make proper utilization of the latest development of satellite-based remote sensing technology for acquisition of timely information on the aerial extent, condition and growth of rice in the country, better monitoring & estimation of major agricultural crop rice to support national food security.
- Development of a integrated RS-GIS decision support system equipped with:
  - Comprehensive geospatial data
  - Appropriate algorithm for monitoring of agricultural crops
  - Framework for time series geospatial data analysis
- Find out appropriate time series satellite data combination for application in physiographically different land areas in the country.



### Implementation:

- Collection of satellite data.
- RS methodological development for retrieval of agricultural information.
  - Application-oriented functional methodology for processing of large volume of satellite data
  - Incorporation of ground truth data
  - Verification, correction and validation
  - Assessment of accuracy
- Development of spectral surface feature signature & biophysical crop parameter database.
- Application of the methodology & analysis and interpretation of results.

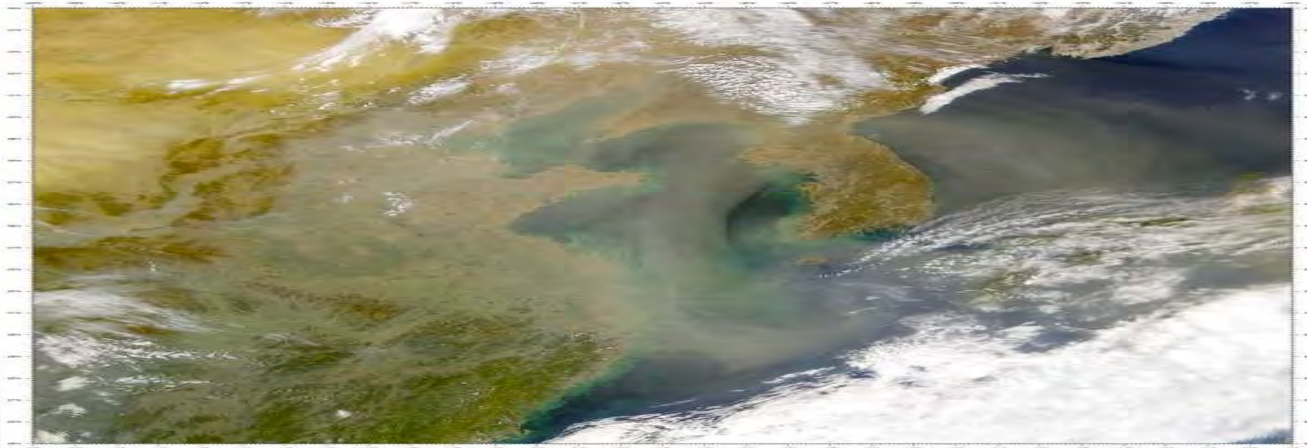




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## *Pilot Project 2*

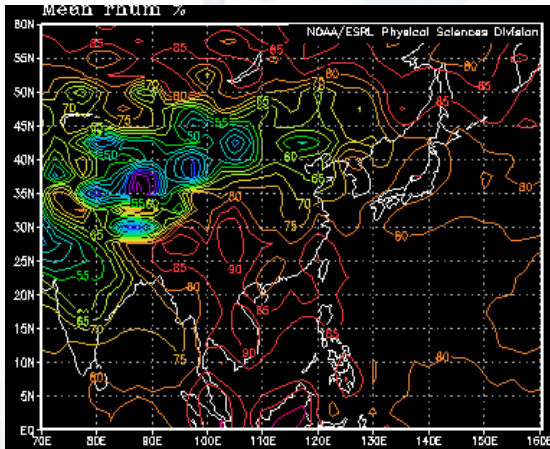
### **Pilot Project 2 - Remote Sensing Monitoring of Dust and its Applicative Demonstration in the Arid and Semi-arid Areas**





### Objective:

Using remote sensing technique monitoring dust, including the process of dust occurring and evolution process . The research on remote sensing monitoring of dust will be used to monitor and warning early the dust storm effectively and dynamically, the result of which can be used in environment management and disaster prevention and reduction.







### Implementation:

1. Investigate the spatial distribution of dust in Asia and dynamic research on remote sensing monitoring of dust.
2. Analyzing the radiation characteristics of dust particles in Asia, carrying out the research on dust inversion algorithms from HJ-1 sensor and MODIS sensor.
3. Collecting the remote sensing images of sand storm centers in Asia, finishing the remote sensing image preprocessing.
4. Producing the dust distribution thematic map in Asia , submitting relevant research results.

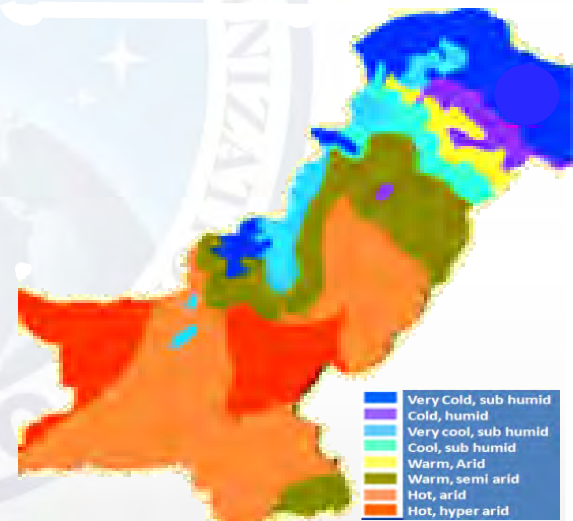
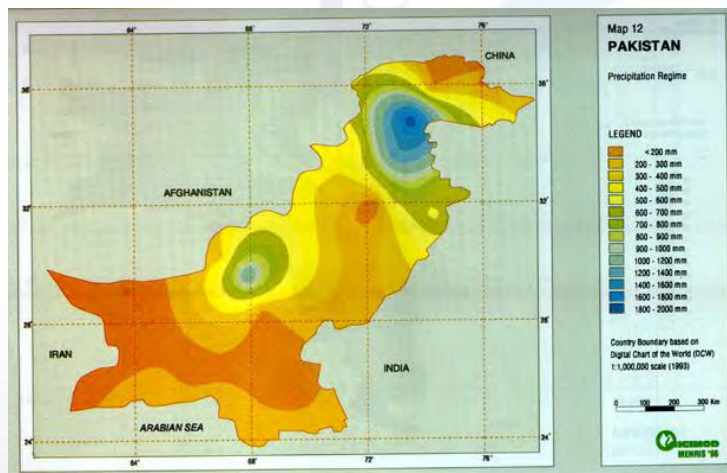


## **Pilot Project 3 - Evaluation of Different Remote Sensing Techniques for Drought Study**



## Objective:

- Exploring HJ-1-A, HJ-1-B and other Satellite data available in APSCO data sharing service platform for drought monitoring in rain-fed areas of Pakistan
- Defining and evaluating different indices pertaining to meteorological data and vegetation
- Impact study of vegetation in rain-fed areas as a result of drought
- Suggest possible strategies towards mitigation of drought related impacts







### Implementation:

1. First phase: Mapping of severe drought affected areas based on past events
2. Second phase: Calculation of different vegetation indices using HJ-1A, HJ-1B data
3. Third phase: Comparison of vegetation indices derived from Hyperspectral and Multispectral data
4. Fourth phase: Comparison and analysis of Hyperspectral & Spectrometer Data



## Pilot Project 4 - Estimation of Rice Field using Multiple Satellite Sensors

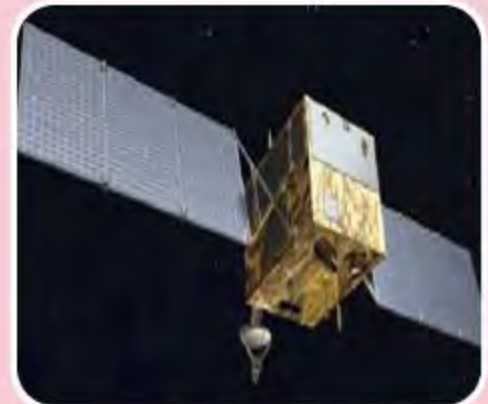
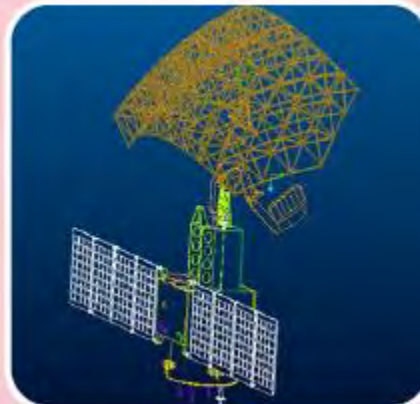
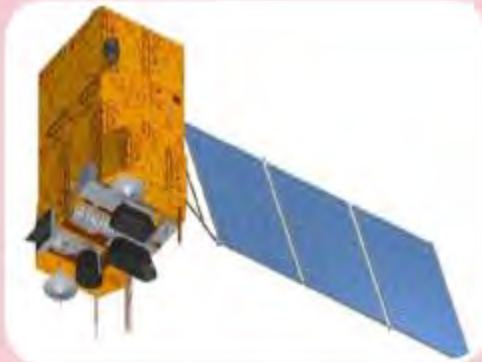






### Objective:

- To expand the collaboration under APSCO Data Sharing Platform project to incorporate SAR and High-Resolution (HR) satellite images.
- To develop method to estimate rice field based on data from various types of satellite sensors and compare it with existing method which is based only on medium-resolution passive-sensor images from HJ-1A satellite (SMMS).





### Implementation:

1. Data Pre-Processing: Select satellite images (HJ-1A, ZY-02 and HJ-1C). And divided the image into 2 sets:
  - First set (2011-2012): will be used to create a Normal Difference Vegetation Index (NDVI) profile.
  - Second set (2013-2014): will be used to estimate the rice field based on NDVI profile.
2. Perform corrections on all selected images
3. Modify Existing Algorithm
4. Estimate Rice Field:
  - Perform the profile matching between the profile from images in the 1st data set and the NDVI profile for 2-3 crop cycles ,
  - Create rice field maps for all (five) periods of rice season.
5. Evaluate performance of the method of estimating rice field by
  - Compute estimation errors for each period of rice season by performing ground check (at least 80% accuracy)—field inspection 3 times,
  - Determine improvement relative to the existing method which is based only on medium-resolution satellite (SMMS) images.



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# ***Support on the Disaster Assessment to APSCO Member States***



- Provided remote sensing images to Thailand for the flood disaster in year 2011
- Provided remote sensing images to Turkey for the earthquake disaster in year 2011
- Provided remote sensing images to Pakistan for the earthquake disaster in year 2013
- Provided remote sensing images to Peru for the earthquake disaster in year 2013





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**Thank You!**