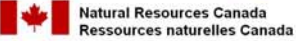# The use of Remote Sensing Products for Early Wildland Fire Warning and Detection: Contributory Projects within GOFC-GOLD-Fire

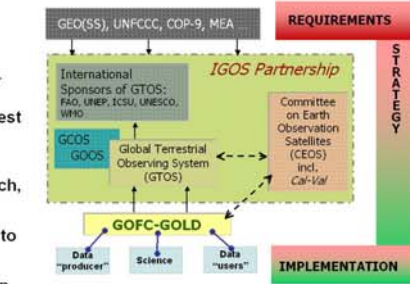## The Global Wildland Fire Early Warning Consortium

(1) Global Fire Monitoring Center (GFMC), Max Planck Institute for Chemistry, c/o Freiburg University / United Nations University, Freiburg, Germany; (2) University of Maryland, Department of Geography, College Park MD USA; (3) Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie ON Canada; (4) Deutsches Zentrum für Luft- und Raumfahrt, Optical Information Systems, Berlin, Germany; (5) Canadian Forest Service, Northern Forestry Centre, Edmonton Canada; (6) Bureau of Meteorology Research Centre, Australia; (7) Bushfire Cooperative Research Centre, Australia

Australian Government — Bureau of Meteorology
bushfire CRC
CSA ASC
Natural Resources Canada — Ressources naturelles Canada
DLR
UNIVERSITY OF MARYLAND
MAX PLANCK GESELLSCHAFT

GOFC/GOLD Fire overview

GOFC-GOLD — Global Observation of Forest and Land Cover Dynamics

• GOFC-GOLD (Global Observation of Forest and Land Cover Dynamics) is a coordinated international effort to ensure a continuous program of space-based and on-the-ground forest and land cover observations for global monitoring of terrestrial resources and the study of global change.

• A network of participants implementing coordinated research, demonstration and operational projects

• A vision to share data, information and knowledge, leading to informed action and decision support

• A long term process of building an improved match between Observations, Data Products and User Needs

http://www.fao.org/gtos/gofc-gold/index.html

GEO(SS), UNFCCC, COP-9, MEA
REQUIREMENTS
International Sponsors of GTOS: FAO, UNEP, ICSU, UNESCO, WMO
IGOS Partnership
STRATEGY
GCOS GOOS
Global Terrestrial Observing System (GTOS)
Committee on Earth Observation Satellites (CEOS) incl. Cal-Val
GOFC-GOLD
Data "producer" — Science — Data "users"
IMPLEMENTATION

Fire Mapping and Monitoring Implementation Team Priorities
http://gofc-fire.umd.edu

- **Fire Danger Rating Development**
- **Near Real Time Daily Active Fire Monitoring**
- Geostationary Global Fire Network
- Planning Fire Monitoring on Next Generation Polar Orbiters
- Multi-source fire information integration
- Burned Area Monitoring
- Systematic product validation
- Near real-time fire emissions modeling
- Web based Distribution Systems
- **New technologies: Sensor Web, Fire Characterization**
- **Outreach to management and policy maker communities**
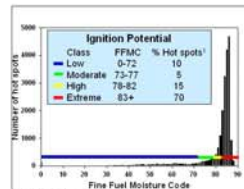
Early warning systems and fire danger

Fire danger: fixed and variable factors that determine the ease of ignition, rate of spread, difficulty to control and fire impact.
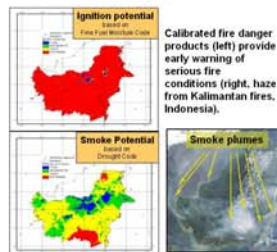
Fuel type examples

Satellite data for fire danger rating
• land cover type
• vegetation condition
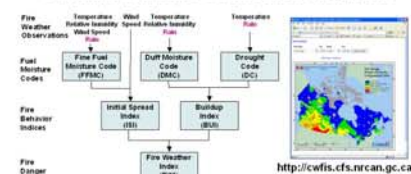• weather information
• hot spot data for early detection

Ignition Potential			
Class	FFMC	% Hot spots[1]	
Low	0-72	10	
Moderate	73-77	5	
High	78-82	15	
Extreme	83+	70	

[1] 20,900 Southeast Asia hot spots (1995-96, 2000)

Example GOFC/GOLD contributory projects

Southeast Asia Regional Fire Danger Rating System

Ignition potential based on Fine Fuel Moisture Code
Smoke Potential based on Drought Code
Smoke plumes

Calibrated fire danger products (left) provide early warning of serious fire conditions (right, haze from Kalimantan fires, Indonesia).

http://www.kjc.gov.my/english/service/climate/fdrs1_x.html

LAPAN Remote Sensing of Fire Danger Rating System (Indonesia)

http://www.lapanrs.com/SMBA/smba.php?hal=3&kat=fd&per=hr&lg=en

Canadian Wildland Fire Information System

http://cwfis.cfs.nrcan.gc.ca/

USFS Seasonal Fire Risk Forecasts

http://www.fs.fed.us/pnw/corvallis/mdr/mapss/fireforecasts.htm

Early hotspot detection

Present

Moderate and coarse resolution
• MODIS: Moderate Resolution Imaging Spectroradiometer
• systematic
• full global coverage
• less sensitive to small fires
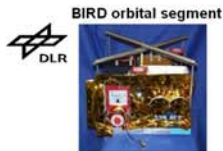
High resolution
• BIRD: Bispectral Infrared Detection
• experimental
• limited coverage
• more sensitive to small fires

	WAOSS-B	MIR	TIR
wavelength	600-670nm 840-900nm	3.4-4.2µm	8.5-9.3 µm
focal length	21.65mm	46.39mm	46.39mm
detector	CCD	MCT	MCT
IFOV[1]	185m	370m	370m
swath width[1]	533km	190km	190km

[1] at 572km orbit height

BIRD sensor characteristics

MODIS Rapid Response, Web Fire Mapper and customized services

Web Fire Mapper: Namibia

http://maps.geog.umd.edu

E-mail alerts and text messages

BIRD orbital segment

MODIS vs. BIRD

Forest fires detected by MODIS and BIRD in Portugal on 4 August 2003. Color coded Fire Radiative Power (in MW) of hot spots is projected on the 0.9 µm NIR band.

Future

USA: Visible Infrared Imager Radiometer Suite (VIIRS) on National Polar Orbiting Environmental Satellite System (NPOESS)

• NPOESS is a NASA-NOAA-DoD program
• First VIIRS will fly on the NPOESS Preparatory Project (NPP)
• VIIRS processing, archive and access for civil and science communities will be done by NOAA
• VIIRS will have near real time global thermal anomalies (Active Fire) product

http://www.ipo.noaa.gov

ESA: Global monitoring for Environment and Security (GMES) Sentinel satellites

http://www.gmes.info

CONAE (Argentina): NIRST with Canadian Space Agency cooperation on NASA/CONAE Aquarius / SAC-D mission

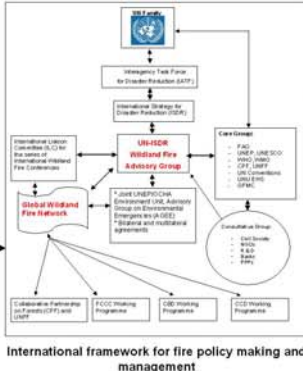http://www.conae.gov.ar/eng/satelites/sac-d.html

FIRES: Fire Recognition Satellite System (initiated by DLR, Germany)

Real time transmission of fire characteristics

Political and management outreach

GOFC/GOLD-Fire promotes interaction between a number of major communities

Remote Sensing and Operational R and D
Fire Observation Systems - Experimental - Operational
GOFC/GOLD Fire
Fire Research and Global Change Research
Operational Fire and Resource Management and Policy

International framework for fire policy making and management

Facilitator / Secretariat: Global Fire Monitoring Center (GFMC)
http://www.gfmc.org
http://fire.uni-freiburg.de

International Agreements and Policies:
The Kyoto Protocol (16 February 2005)
International Wildland Fire Strategy (FAO Ministerial Meeting, 14 March 2005)

Global Wildland Fire Network

Capacity Building by the GFMC and United Nations University (UNU) Institute for Environment and Human Security

Development of national, regional and international wildland fire management strategies

International Wildland Fire Summit (2003)