

# ***NASA Science Serving Society:*** **Improving Capabilities for Fire Characterization to Effect Reduction in Disaster Losses**

**A NASA / USFS Partnership**





### 火山噴火予知と火山防災に関する研究

様々な火山観測技術による観測

- 航空機に搭載された機器による地表温度の観測
- 人工衛星による地震変動の観測
- 連続観測を実施している火山
  - ・那須岳
  - ・富士山
  - ・伊豆大島
  - ・三宅島
- ポアホール式地震計・傾斜計
- マagma溜まり

リモートセンシング技術を用いた火山活動観測 (新装置の開発)

三宅島

二酸化硫黄ガス分布及び温度観測手法を開発

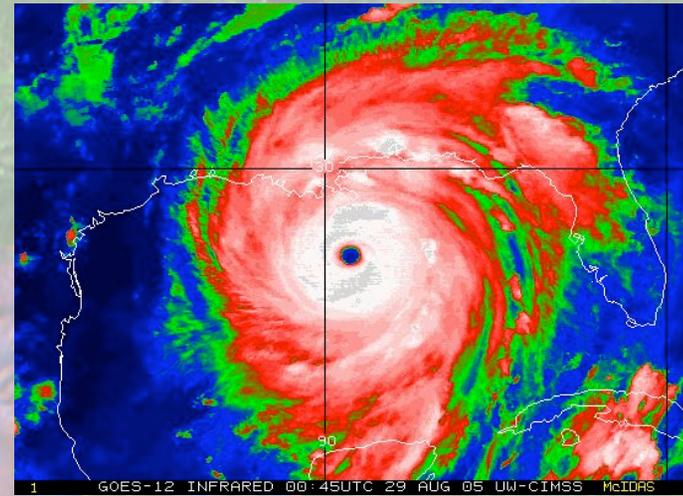
GOTENBA Hazard MAP  
time = 264 hour  
溶岩流の流路範囲の予測

各種観測技術による火山活動の監視

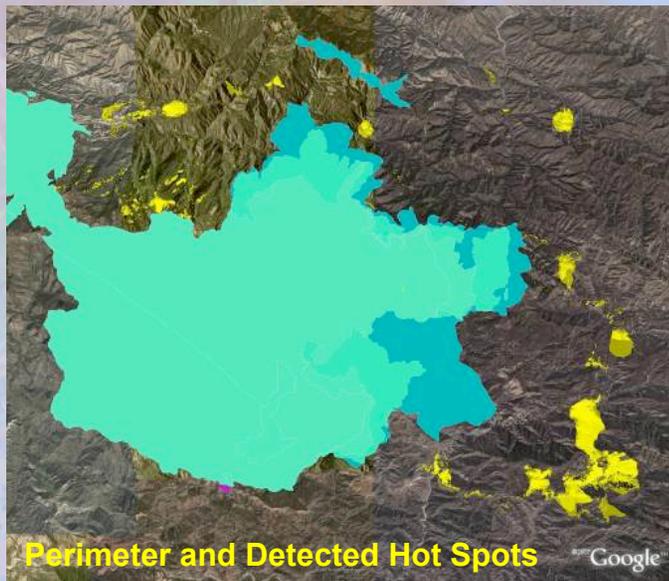
マagma移動・噴火過程の解明

火山活動のモデル化と災害予測

住民の避難、避難勧告解除後の安全に寄与

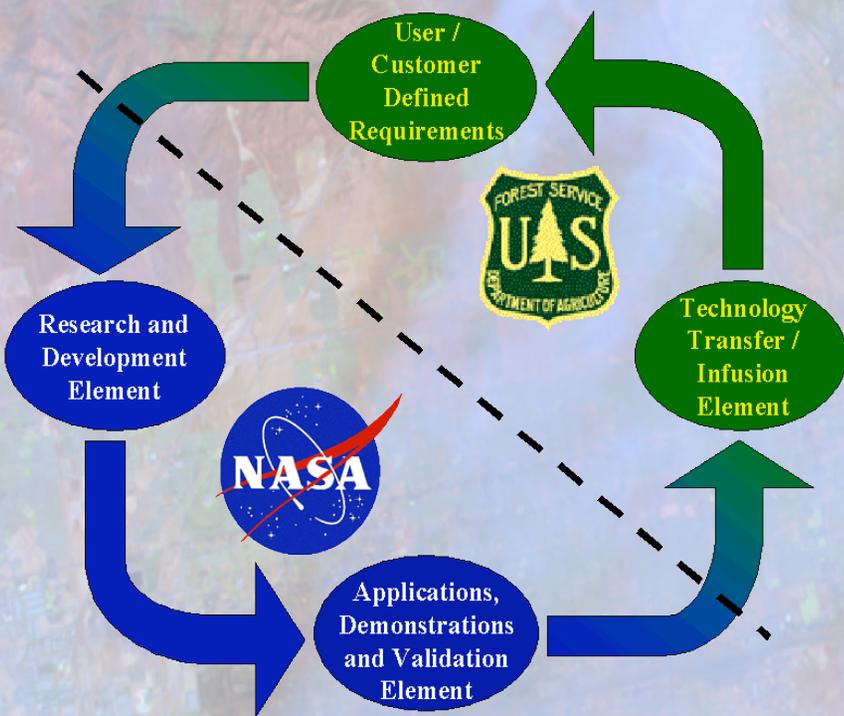


# The Delivery and Ease of Use of Timely Data!!



# Focus on Partnering: Not a One-Way Street

The **Wildfire Research and Applications Partnership (WRAP)** is funded collaboratively between NASA (ARC) and USDA-Forest Service to explore, develop, demonstrate, and transfer NASA capabilities to the USFS, NIFC and other partner fire management agencies:



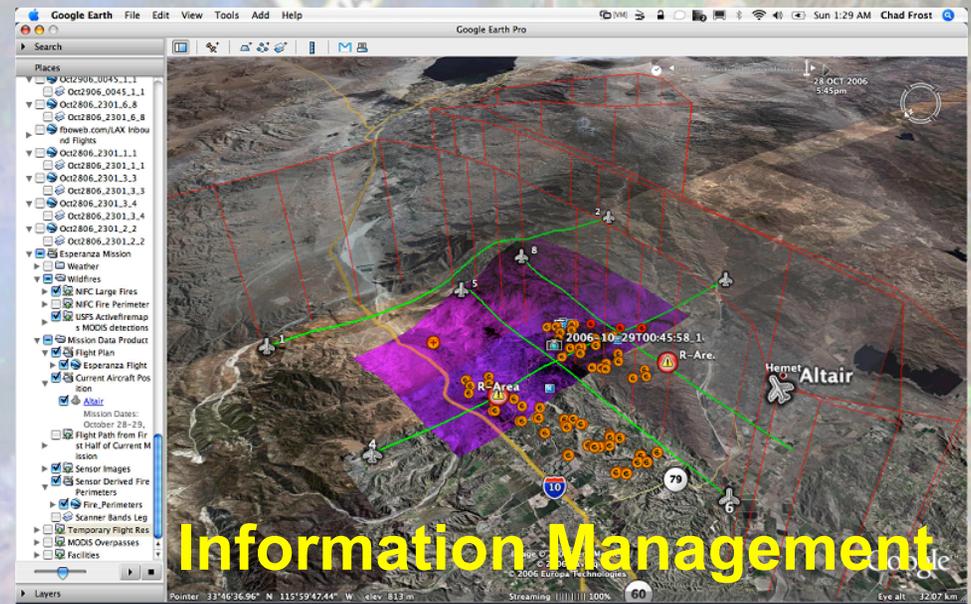
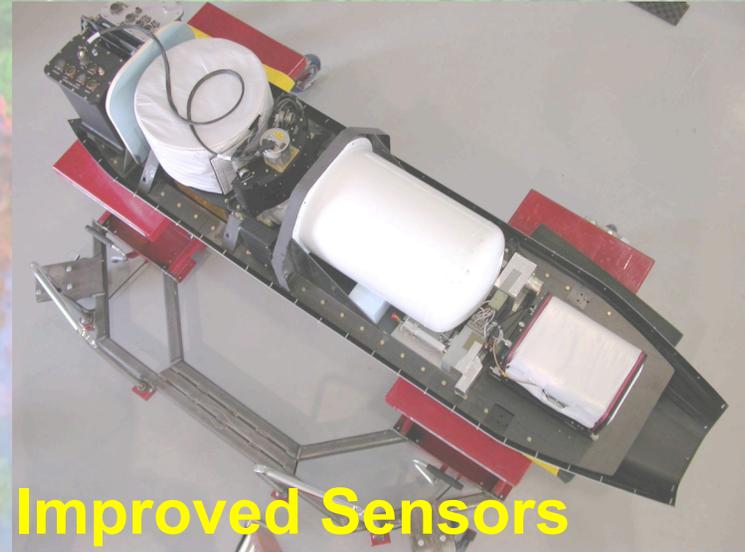
## Objectives:

- Collaboratively define needs and data / information gaps for improving wildfire imaging;
- R & D of those required technologies;
- Demonstration and validation of those technologies;
- Technology transfer and training.

## To:

- Increase information content;
- Reduce information delivery time;
- Simplify data integration processes.

# Four Major Capabilities-Gap Fillers



# ***“Turning Swords Into Plowshares”***

## **Adaptation of UAVs to Support Civilian Use**

### **NASA “Ikhana” UAV**

The *Ikhana* is a derivative of the Predator B (MQ-9) UAV, designed specifically as a NASA science and research platform. *Ikhana* is a Native American Choctaw word meaning: Intelligence, Conscience or Aware

Capable of medium to high altitude operations for ~24-hour periods.  
2400 lbs of instruments; Operations: ~50K ft; 170-200kts  
Length: 36 feet, Wingspan: 66 feet  
Max T/O weight: 10,500 pounds

Capable of autonomous payload operations and real-time sensor data delivery to anywhere in the world via an onboard satellite communications system.



**NASA Ikhana with Sensor Pod  
under-wing mount**

# Wildfire - CDE

## Decision support tool for wildfire missions

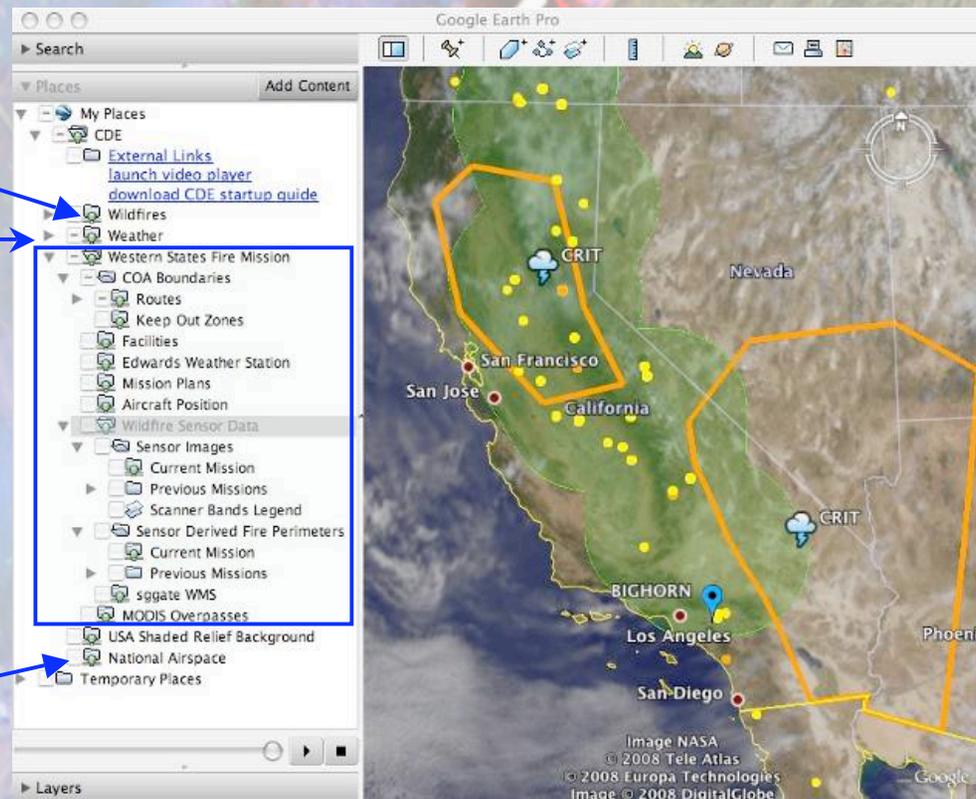
All data visualized in a “freeware” visualization package---GoogleEarth

### Goals

- Mission planning
- Situational awareness
- Data visualization
- Collaboration among distributed

### Users

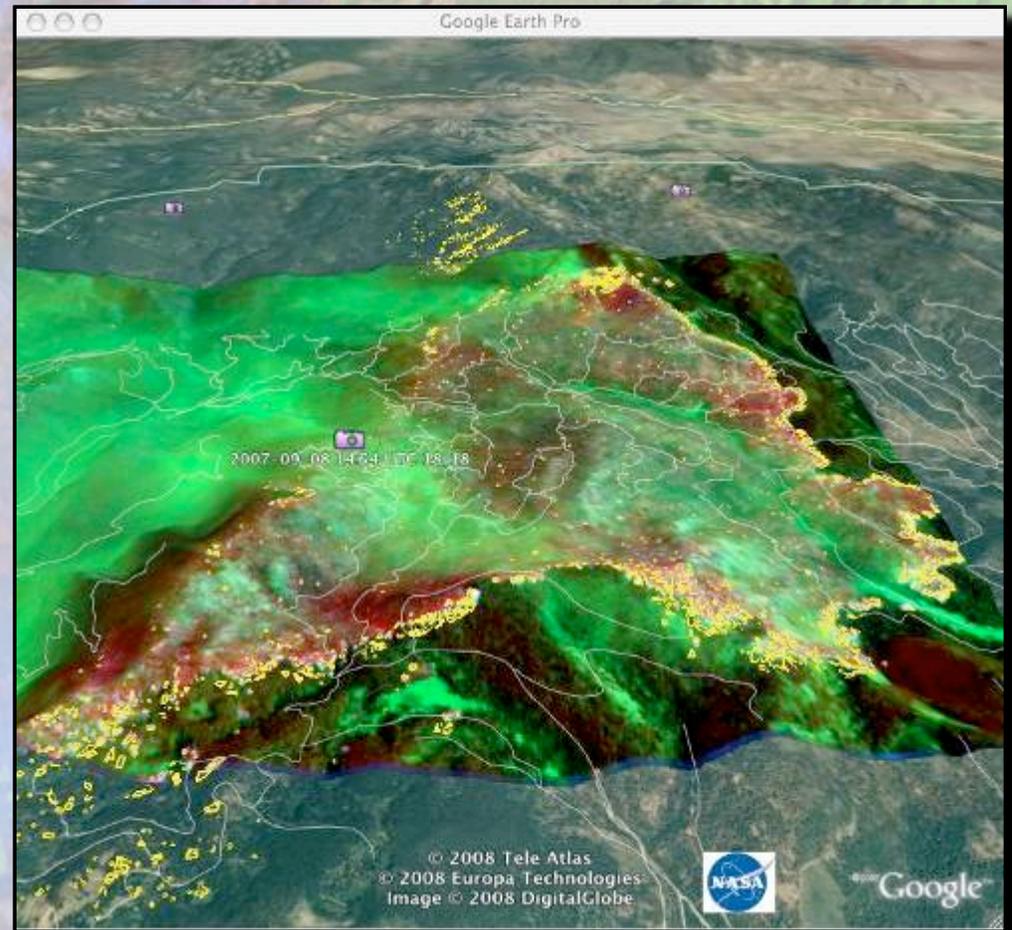
- Mission Development Team
- Data Products Users



# Sensor Data Visualization

## Procedure for viewing sensor data in CDE

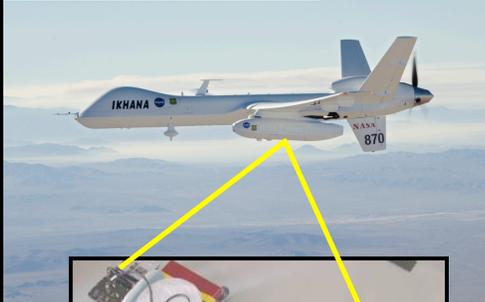
- Camera placemarks appear when images are available
- Click on icon to display thumbnail image
- Download image from server
- “Hot Pixel” detections are available on separate layer
- Adjust 3D view of data draped on terrain



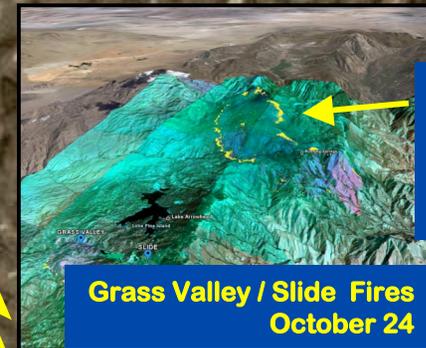
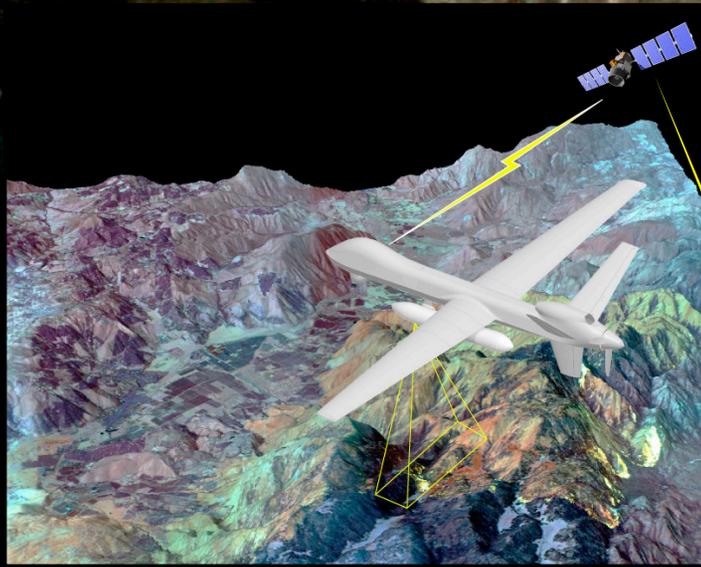
# NASA Science Serving Society: Support to So. California Wildfires – October 2007



**NASA Ikhana UAS**



**NASA Wildfire Sensor**



**Real-Time Imagery & Automated Fire Detects**

**Grass Valley / Slide Fires  
October 24**

**Real-Time Info Distribution to southern CA ICs and EOCs**



**Ikhana Missions**



- Oct 24**
- Oct 25**
- Oct 26**
- Oct 28**

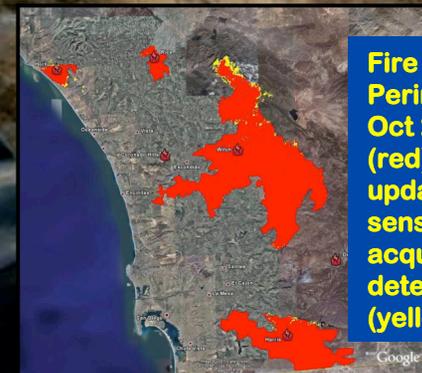
**Supported request by CA-OES, NIFC-NICC, FEMA.**

**Flew four missions (~32 hrs total) over SoCA fires on Oct 24, 25, 26, 28. Mission plans based on near-real-time NASA MODIS satellite sensor fire data.**

**Delivered real-time data to fire Incident Commands (ICs) and county and city Emergency Ops Center's and CA-OES via NASA-developed Collaborative Decision Environment (CDE).**

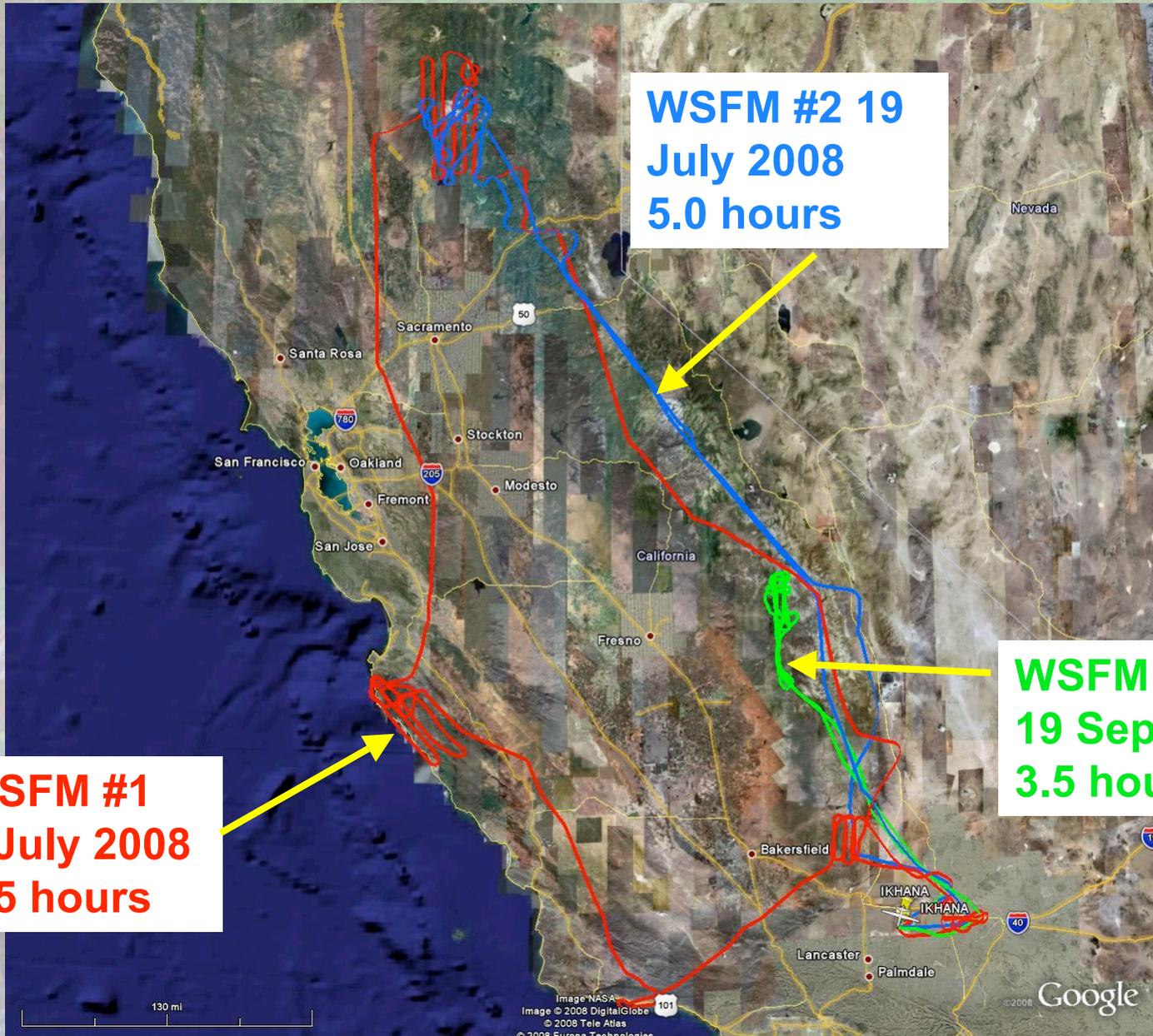
**Over 150 simultaneous users of CDE supported each day and over 40,000 downloads of NASA UAS-acquired data by fire management teams.**

**Efforts saved valuable time, resources and property!!**

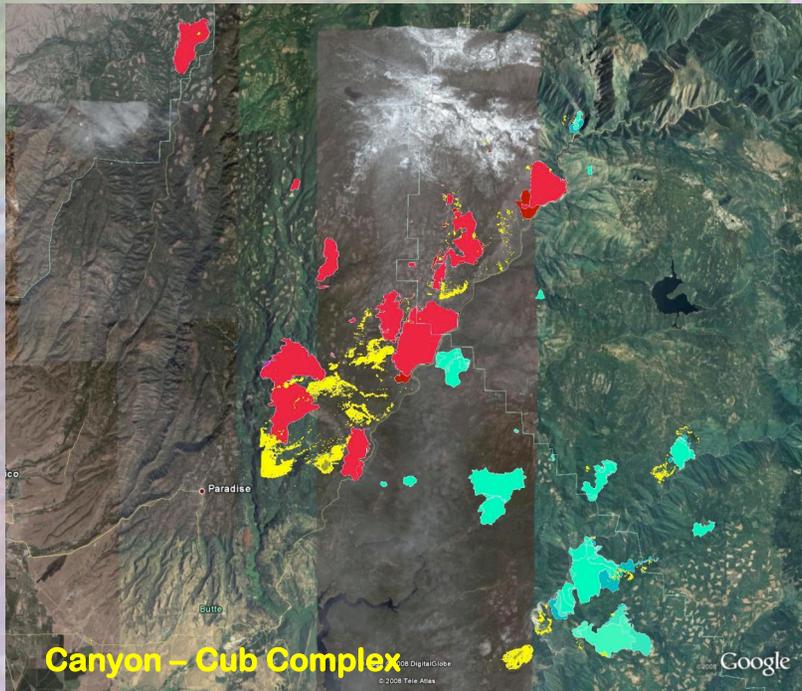


**Fire Perimeters Oct 25th (red) with updated sensor-acquired fire detect data (yellow)**

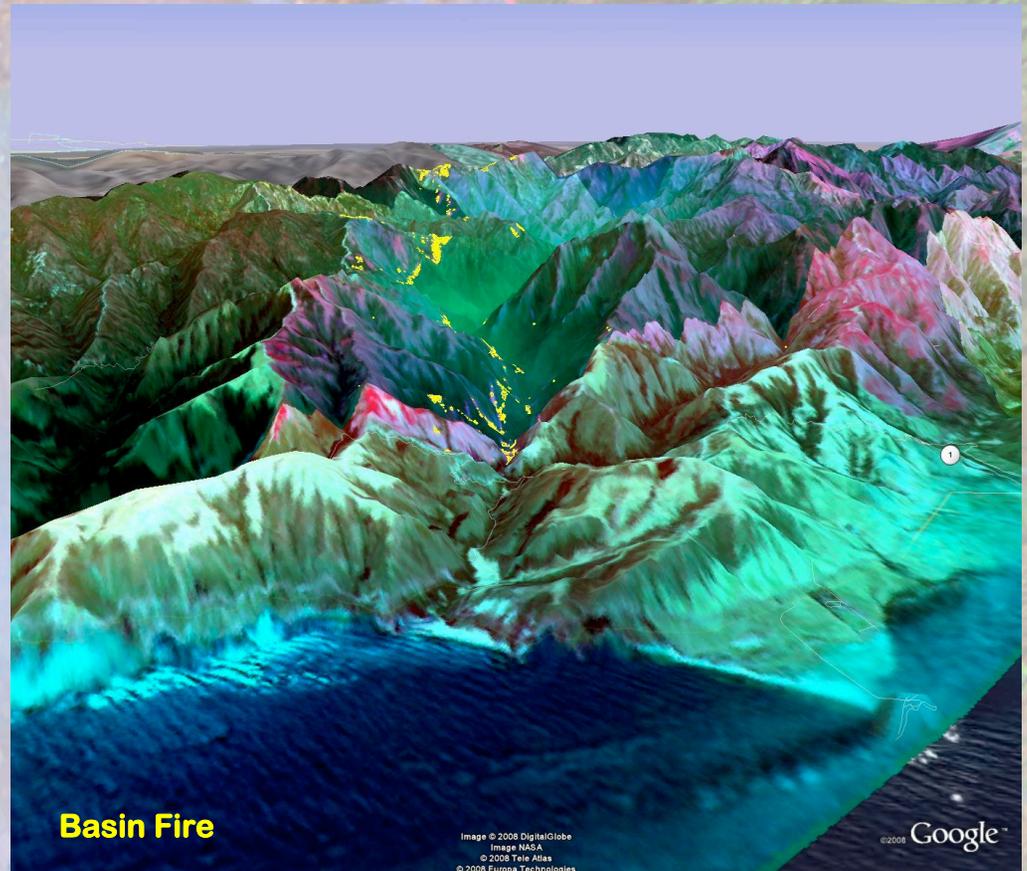
# WSFM – 2008 Flight Tracks



# Northern California Firestorm - 2008



Images From  
8 & 19 July 2008



# How Efforts Improved Preparedness, Response, and / or Resiliency

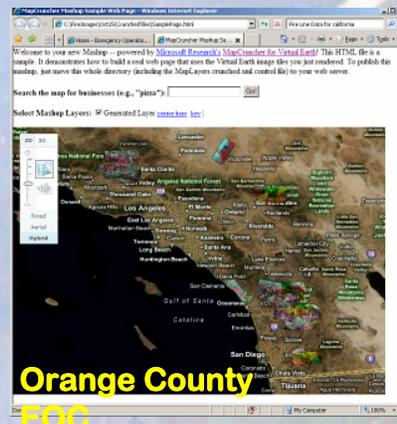
Provided near-real-time information to disaster managers at various responsibility levels, including:

- FEMA Joint Field Office (JFO)
- Emergency Operations Centers (EOC) of San Diego & Orange Counties
- Multi-Agency Coordination Center (MACC)
- Incident Command Posts (ICP); Planning Section, Operations, and Public Information Officers

This allows tactical decisions to be made regarding approaches to fighting the fire and assessment of areas at immediate risk, allowing effective mitigation strategies and evacuation.



**Santiago ICP**



**Orange County  
EOC**



**San Diego EOC**

# **What is the most important aspect of this work for disaster community to take away?**

**NASA is fostering relationships with the hazards and disaster management community to enable improved (and more rapid) assessment tools to develop, evaluate and mature.**

**NASA is actively involved and partnering with other agencies to drive technology, models, information and science to operational use to assist in disaster mitigation and reduction.**

***“Leveraging NASA Scientific and Engineering expertise to minimize disaster impacts and support societal benefits”***