“The Transformational Nature of NSF Long-Term Funding on Santa Ana Wildfires in Southern California”

Invited Presentation with Ilkay Altintas
To the Council on Competitiveness
SDSC, UC San Diego
March 8, 2019

Dr. Larry Smarr
Director, California Institute for Telecommunications and Information Technology
Harry E. Gruber Professor,
Dept. of Computer Science and Engineering
Jacobs School of Engineering, UCSD
http://lsmarr.calit2.net

The Digital Transformation of Environment

- **Water, Fire, & Changing California Climate**
  - **Global Climate Change Drives Regional Climate Disruption**
  - **Common "Mirror World" of Southern California for Fire and Water Management**
  - **Advanced IT/Telecom to Accelerate Response to Wildfires**



Early on October 23, 2007, Harris Fire San Diego

Photo by Bill Clayton, http://map.sdsu.edu/

SoCal's Santa Anna Wildfires: View From NASA's Aqua Satellite's MODIS Instrument

Calit2, SDSU, and NASA Goddard Used NASA Prioritization and OptIPuter Links to Cut time to Receive Images from 24 to 3 Hours



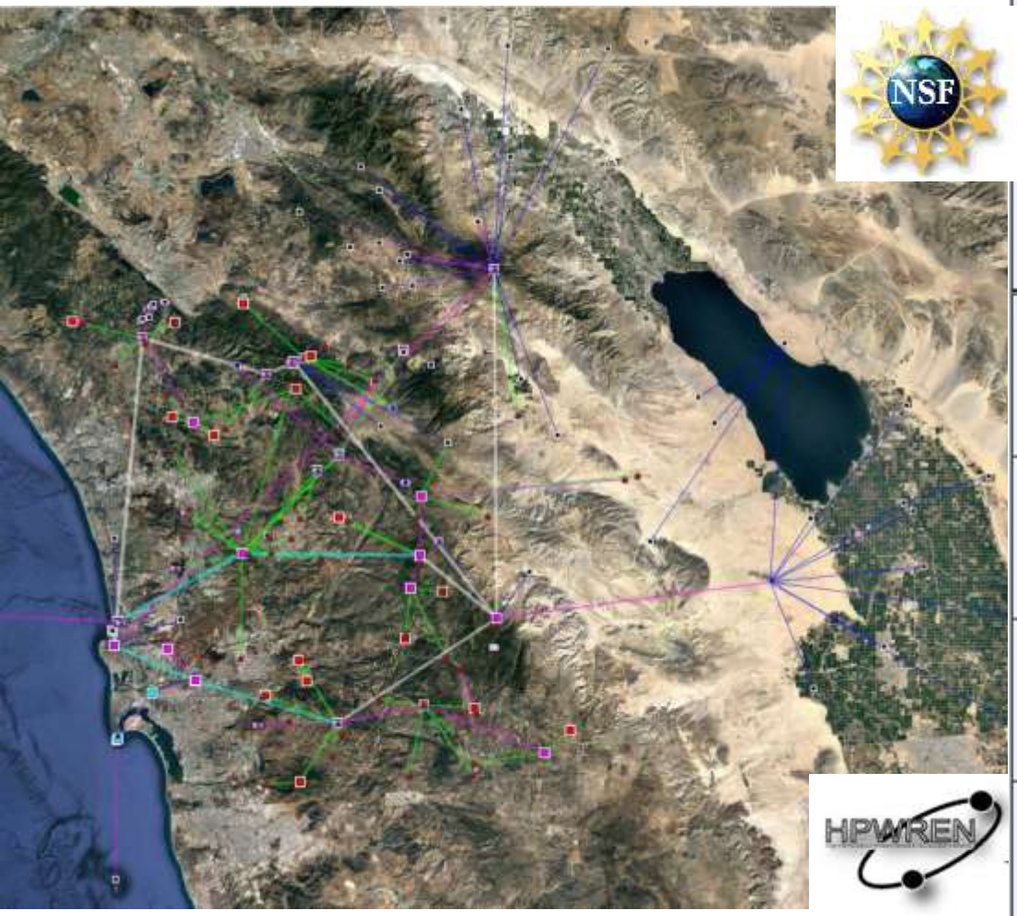
Moderate Resolution Imaging Spectroradiometer (MODIS)

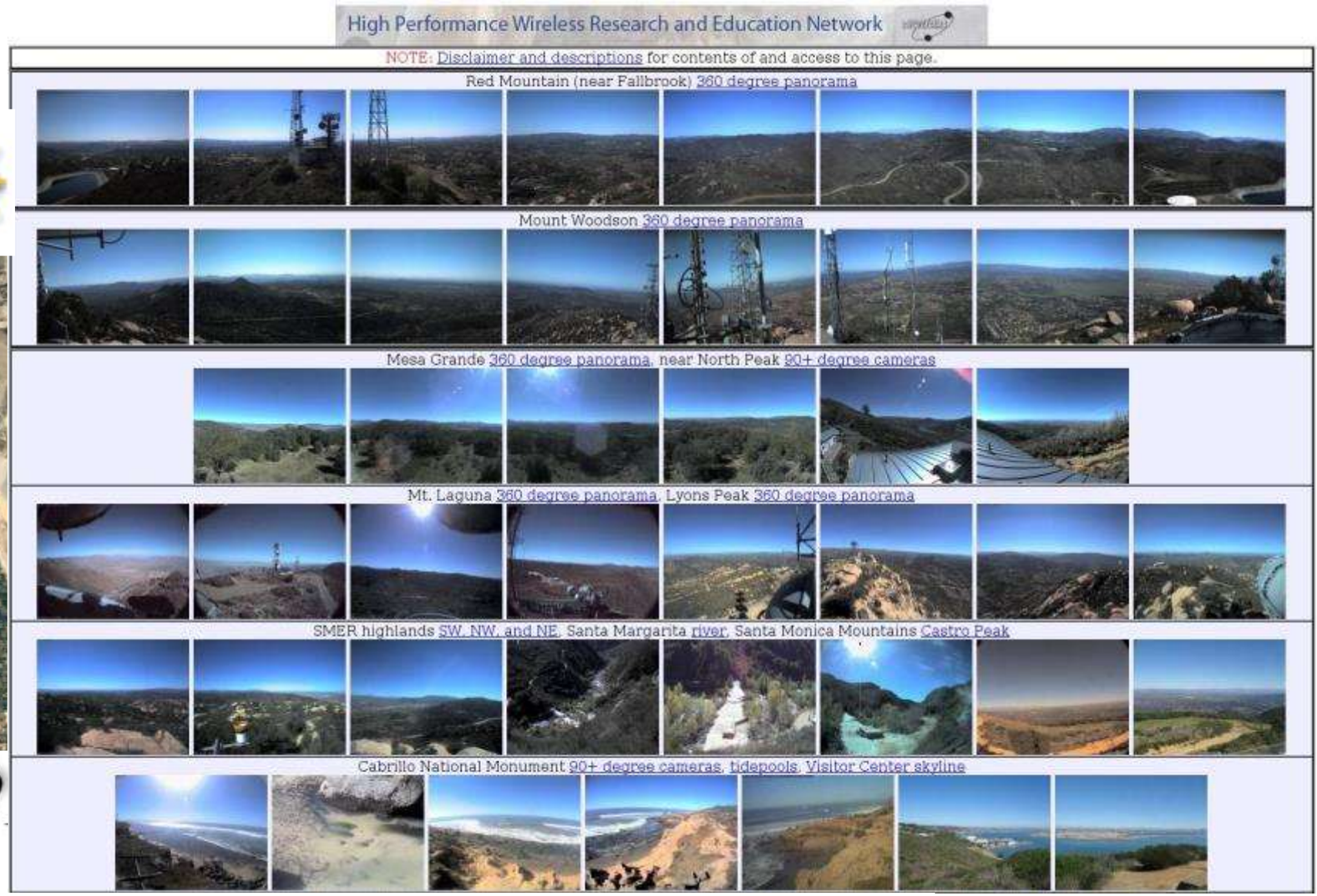
NASA/MODIS Rapid Response

www.nasa.gov/vision/earth/lookingatearth/socal_wildfires_oct07.html

15 Years of NSF-Funded Real-Time Network Cameras on San Diego Mountains for Environmental Observations

Source: Hans Werner Braun, HPWREN PI





UC San Diego

SDSC San Diego Supercomputer Center

Scripps Institution of Oceanography

San Diego State University

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HPWREN Real-Time Network Cameras on Mountains for Environmental Observations and Fires



San Diego County Red Mountain Fire Cameras

- Southeast (left) “Highway” Fire
- Southwest (center rear) “Poinsettia” Fire
- West (right) “Tomahawk” Fire

HPWREN UC San Diego SDSC San Diego Supercomputer Center Scripps Institution of Oceanography Calit2 San Diego State University

The Pacific Research Platform Connects Campus "Big Data Freeways" to Create a Regional End-to-End Science-Driven "Big Data Superhighway" System



Source: John Hess, CENIC

NSF CC*DNI Grant
$6M 10/2015-10/2020

PI: Larry Smarr, UC San Diego Calit2

Co-PIs:

- **Camille Crittenden, UC Berkeley CITRIS,**
- **Tom DeFanti, UC San Diego Calit2/QI,**
- **Philip Papadopoulos, UCSD SDSC, UCI**
- **Frank Wuerthwein, UCSD Physics and SDSC**

Letters of Commitment from:

- **50 Researchers from 15 Campuses**
- **32 IT/Network Organization Leaders**

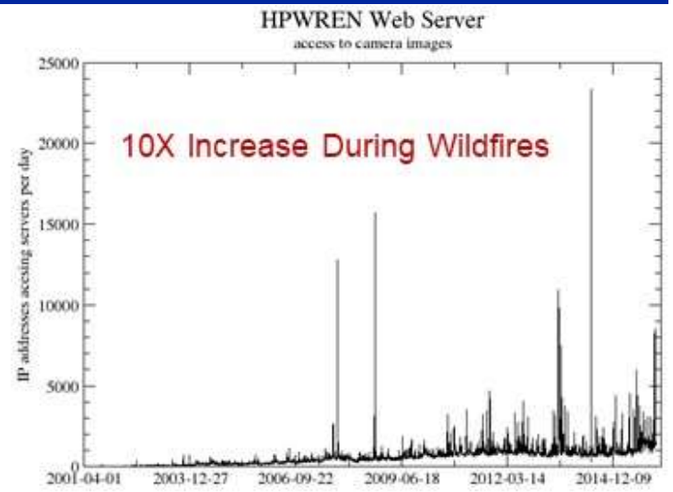
SDSC CITRIS BANATAO INSTITUTE it²

NSF-Funded Pacific Research Platform (PRP) Enabled 2018 Expansion of HPWREN Wireless Connectivity Into Orange County

- **PRP Uses CENIC 100G Optical Fiber to Link UCSD, SDSU & UCI HPWREN Servers**
  - **Data Redundancy**
  - **Disaster Recovery**
  - **High Availability**
  - **Kubernetes Handles Software Containers and Data**



Source: Frank Vernon, Hans Werner Braun HPWREN



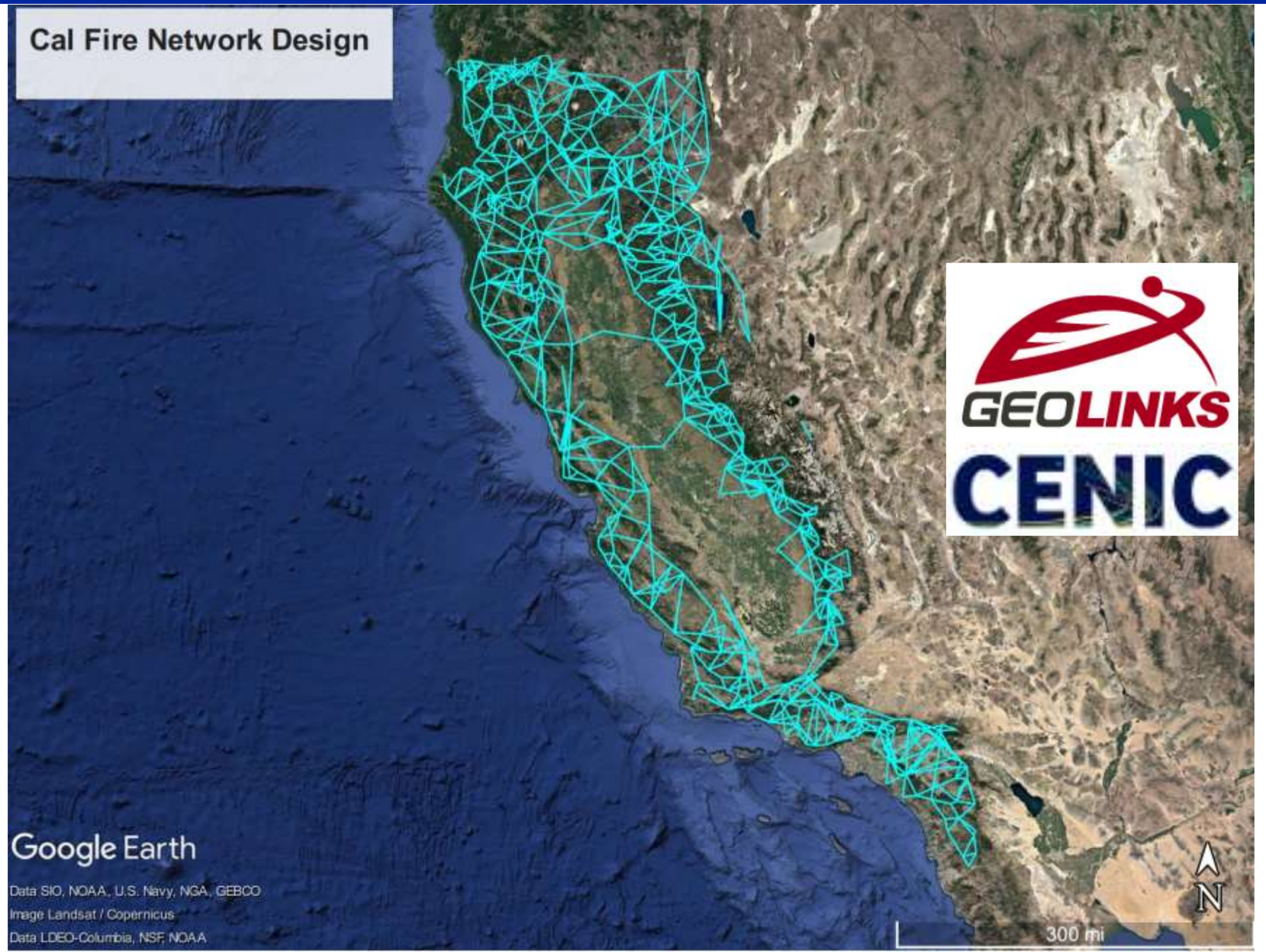
Data From Hans-Werner Braun



UCI Antenna Dedicated June 27, 2017

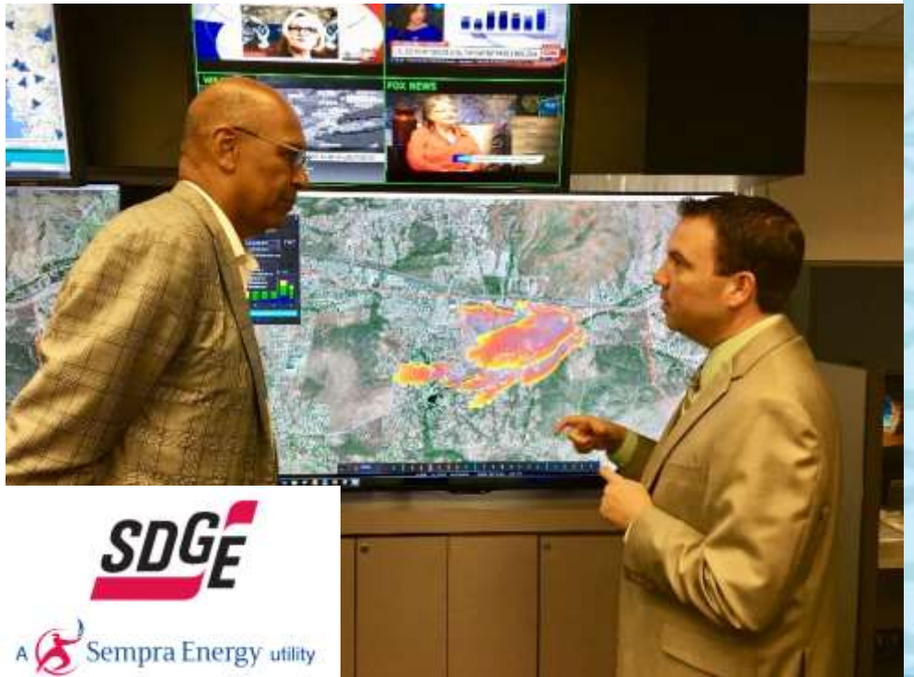
HPWREN · UC San Diego · SDSC San Diego Supercomputer Center · Scripps Institution of Oceanography · Calit2 · San Diego State University

California Public-Private Partnership Plan
To Scale Fixed Wireless With CENIC Optical Fiber Backhaul



San Diego Gas & Electric
Has Been a Pioneering Utility in Wildfire Mitigation





SDGE
A Sempra Energy utility



SAWTi Forecast
@sawti_forecast
Follow

Strong #SantaAnaWinds occurring over Southern CA this morning. Some peak wind gusts since midnight include 57 mph at Devore, 64 mph at Camp 9 and 84 mph at Fremont Canyon.

8:13 AM - 1 Jan 2019

USDA Forest Service, the San Diego Gas and Electric utility (SDG&E), and the University of California, Los Angeles (UCLA)



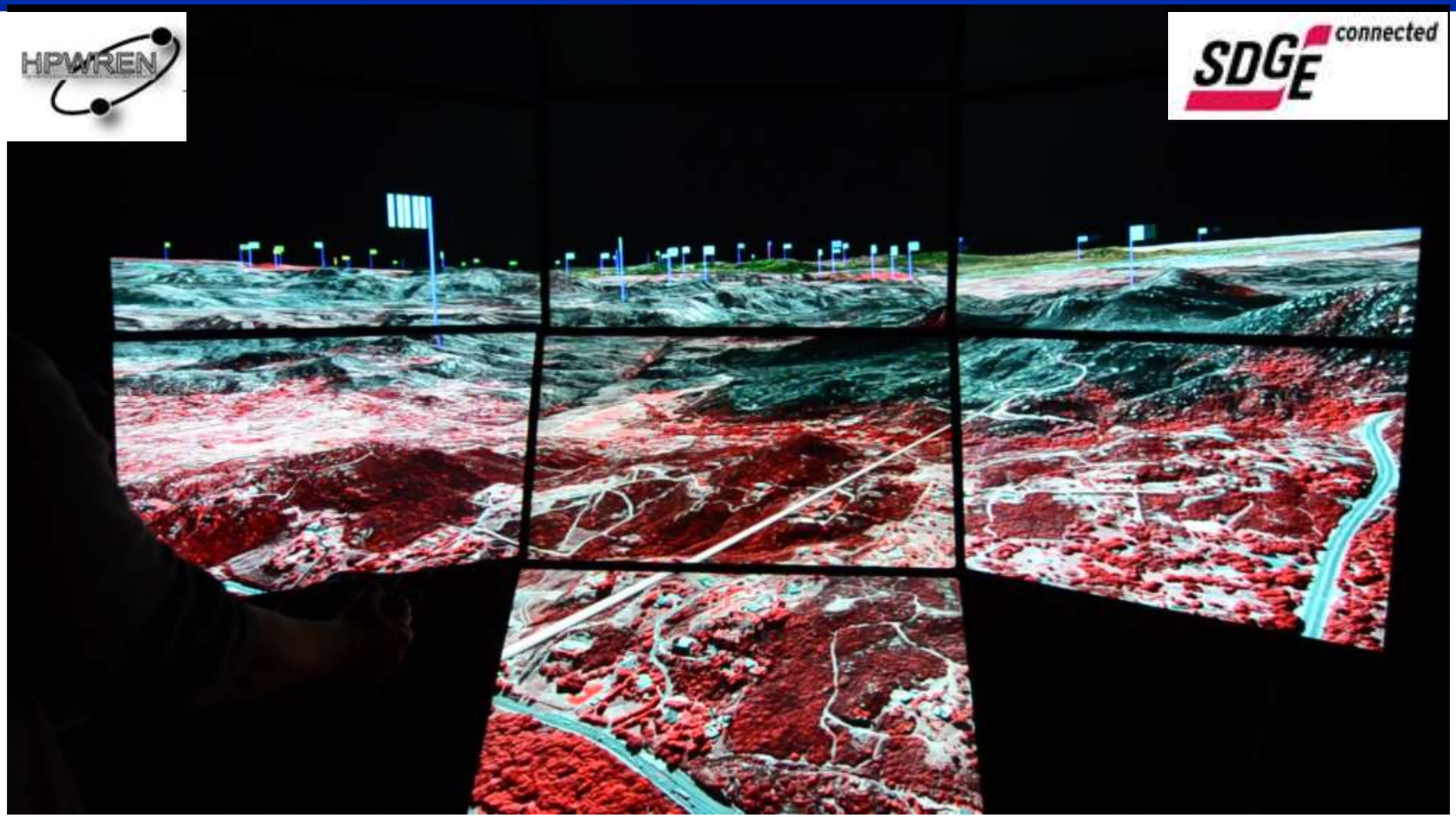
By KURT SNIBBE | ksnibbe@scng.com | Orange County Register
PUBLISHED: December 8, 2017 at 11:06 am | UPDATED: December 8, 2017

Creation of Digital Twin:
Interactive Virtual Reality of San Diego County



0.5 meter image resolution.
2meter resolution elevation

All HPWREN and SDG&E Meteorological Stations Are Represented in Realtime: Wind Direction, Velocity, and Temperature





Source: Jessica Block, Calit2

Using Calit2's Qualcomm Institute NexCAVE for CAL FIRE Research and Planning

Chief Porter was appointed Director, California Department of Forestry and Fire Protection by Governor Gavin Newsom on January 8, 2019



Source: Jessica Block, Calit2

NSF-Funded WIFIRE:
Coupling Wireless Wildfire Sensors to Wildfire Simulations

Technology Projects to Combat California Wildfires Are Recognized with CENIC Innovation Award

WIFIRE PI Ilkay Altintas, SDSC

CENIC 2018
Innovations in Networking Award for Experimental Applications

Nevada Seismological Laboratory
Mackay School of Earth Sciences & Engineering
UNIVERSITY OF NEVADA, RENO



Church Fire, San Diego CA
Alert SD&ECameras/HPWREN
October 21, 2017



Thomas Fire, Ventura, CA
Firemap Tool, WIFIRE
December 10, 2017

Once a Wildfire is Spotted, PRP Brings High-Resolution Weather Data to Fire Modeling Workflows in WIFIRE



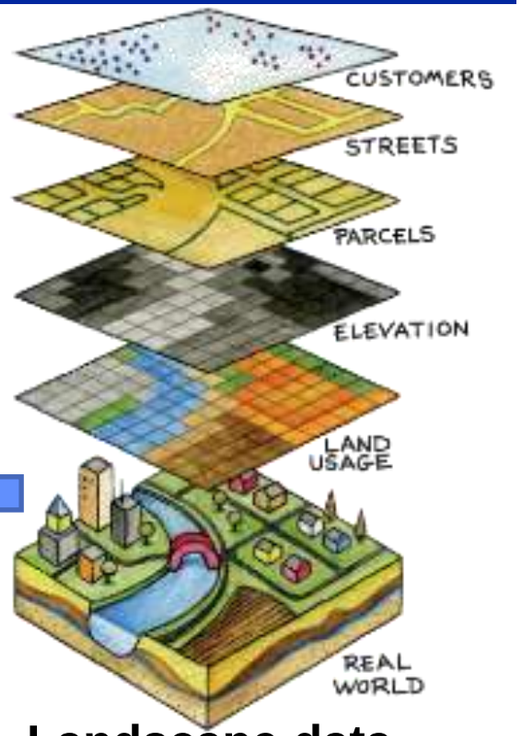
Real-Time Meteorological Sensors





Ilkay Altintas, SDSC

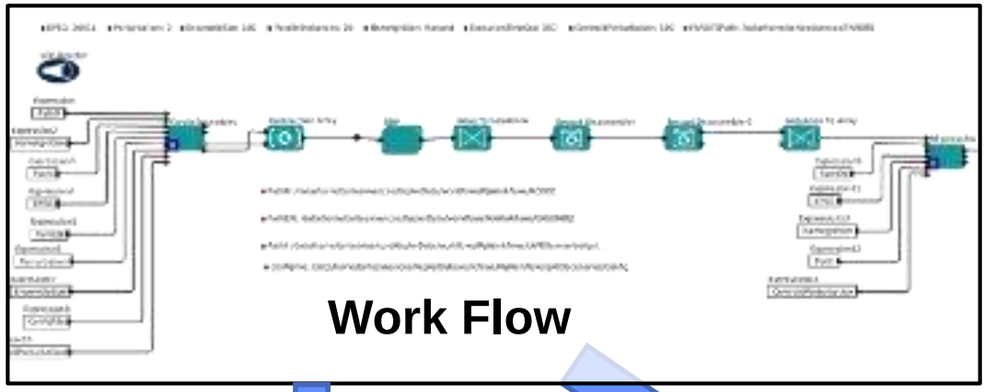




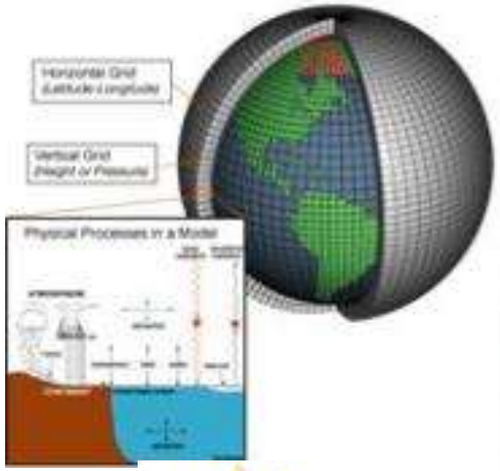
Landscape data

PRP





Weather Forecast



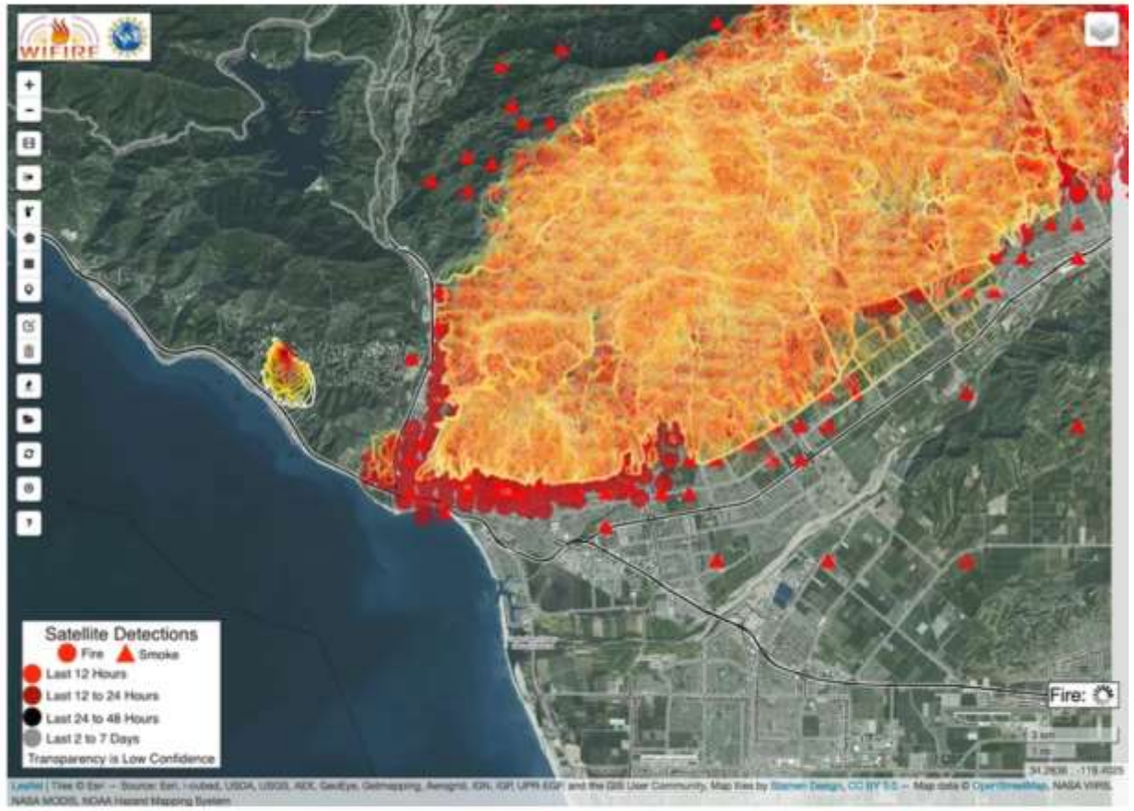






NSF

NSF-Funded WIFIRE Project Has Reached a National Audience



A WIFIRE display showing the Thomas Fire that ignited in Dec. 2017. University of California San Diego

TIME

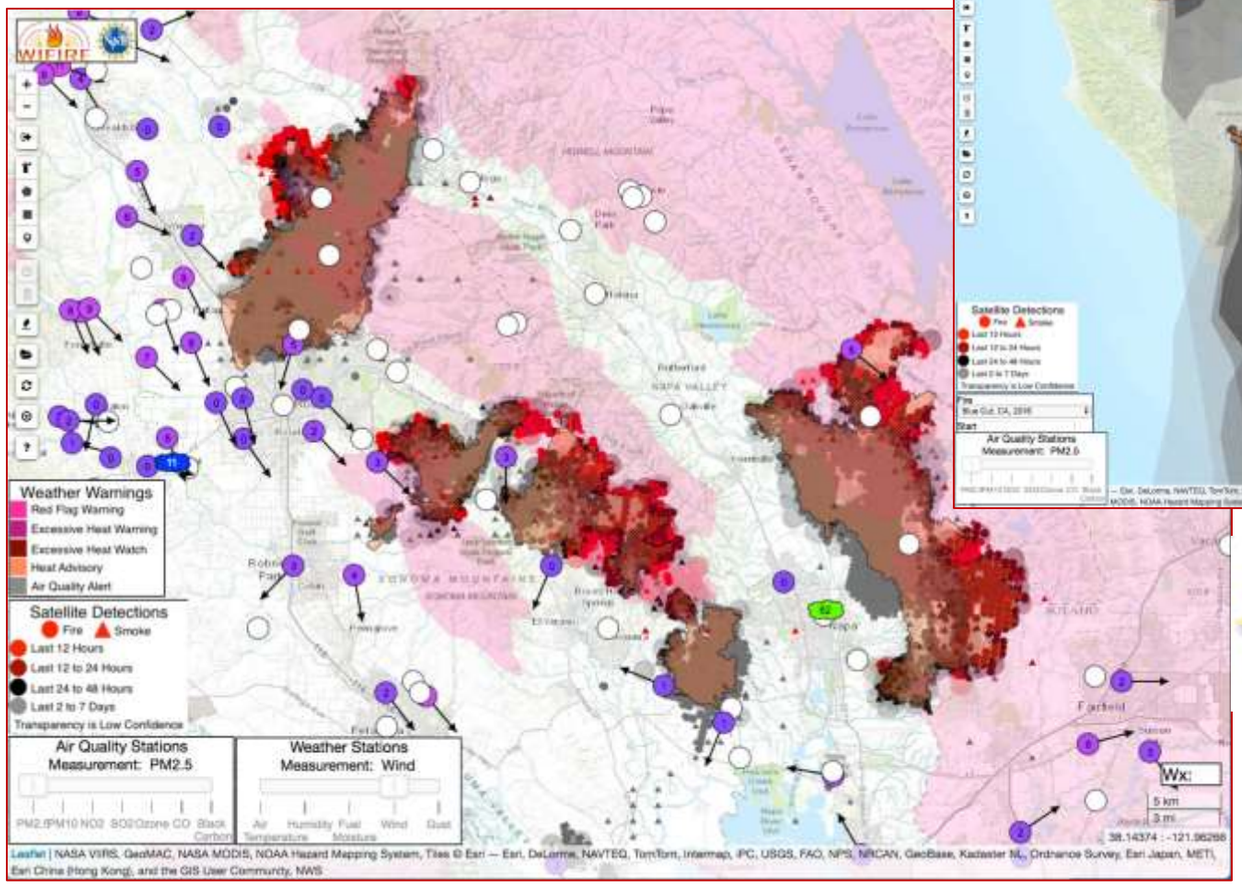
TECH • WILDFIRES

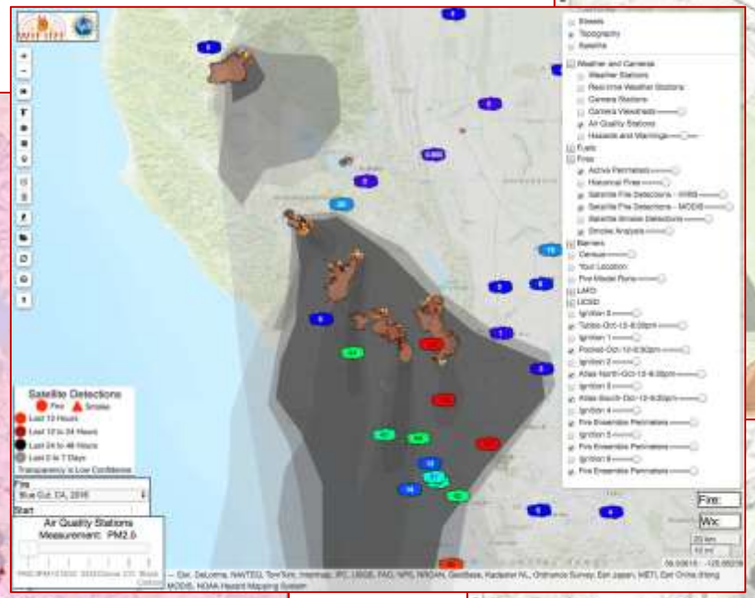
AI Is Helping Fight Wildfires Before They Start

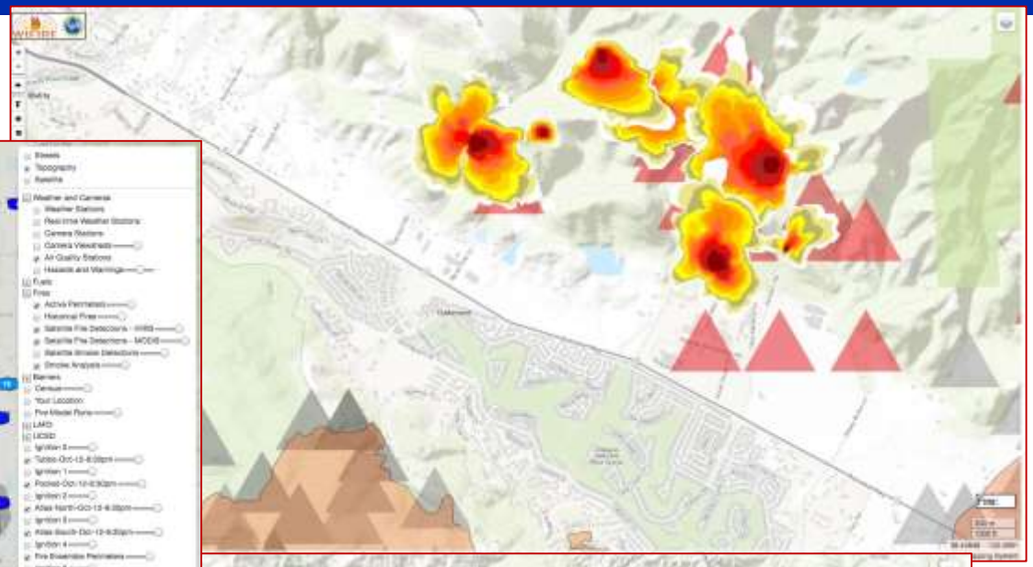
BY ALEJANDRO DE LA GARZA JANUARY 21, 2019

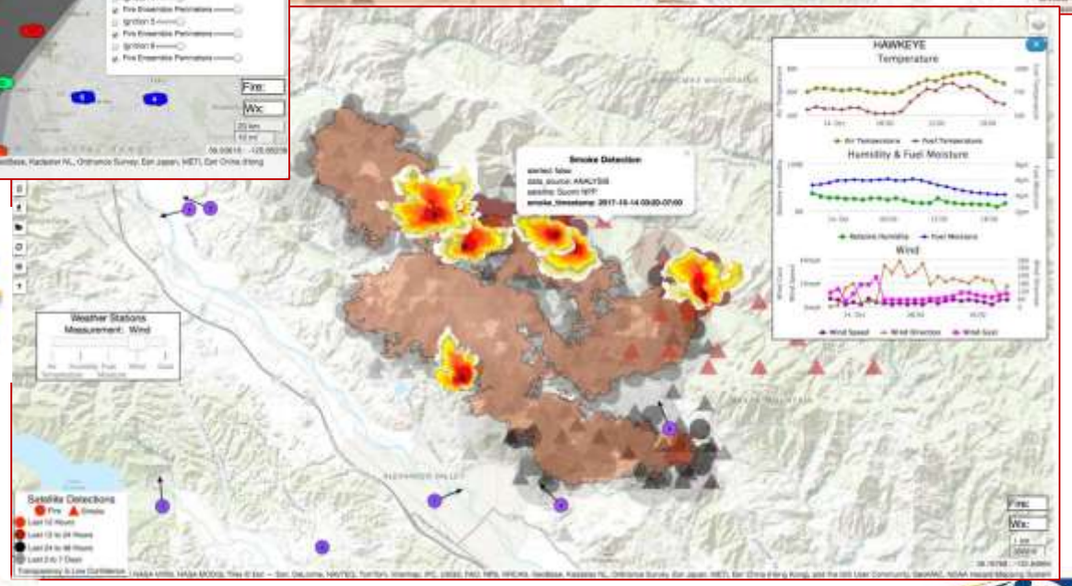
Firemap Was Used For California Wildfires October 2017 through December 2017

800K+ unique visitors and 8M+ hits









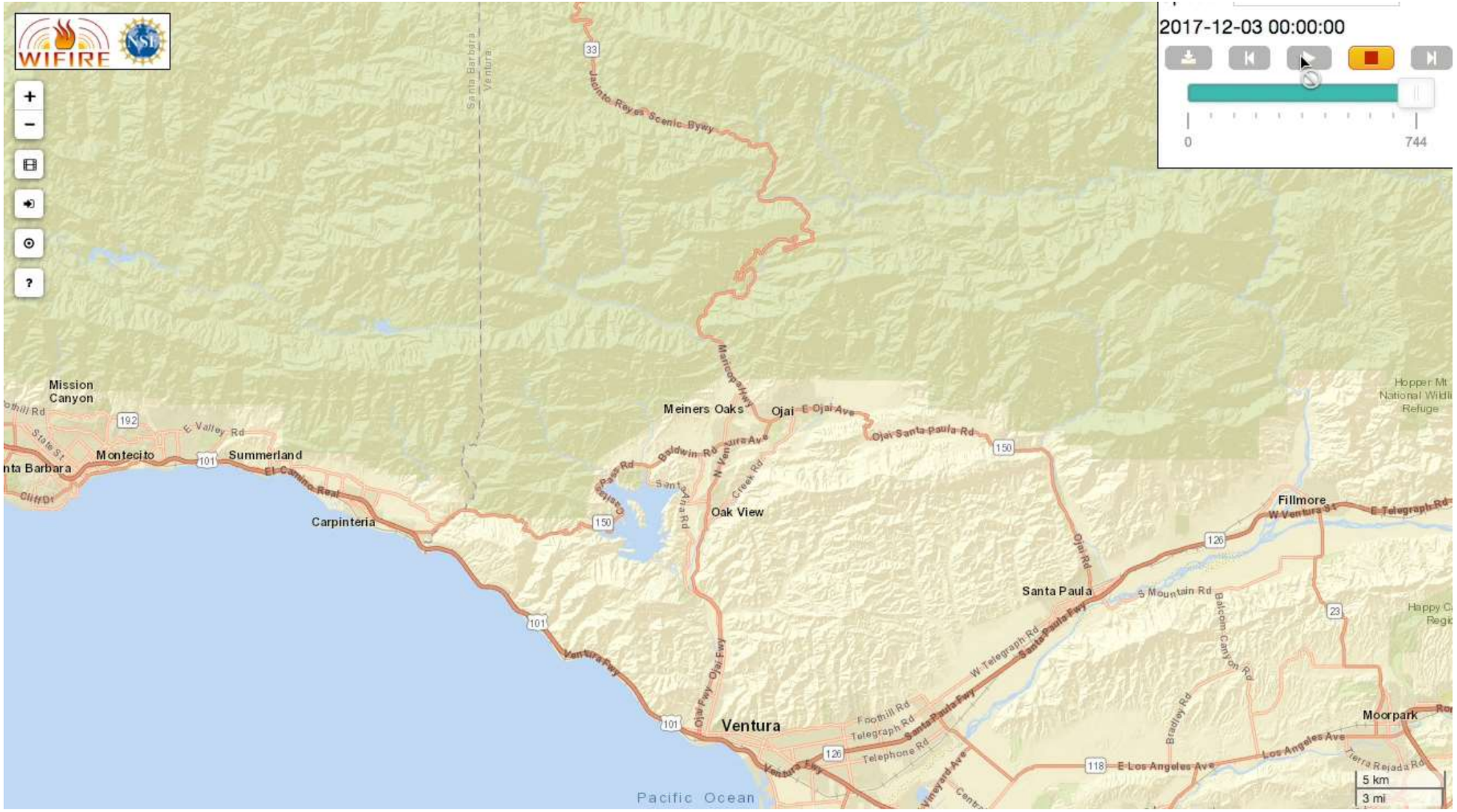
SDSC SAN DIEGO SUPERCOMPUTER CENTER

http://firemap.sdsc.edu

WIFIRE

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Real-time Satellite Detections During Thomas Fire: 12/04/2017- 01/12/2018



San Diego Airborne Intelligence Reconnaissance System (SDAIRS) – San Diego County Lilac Fire (Dec 7-16, 2017)

1. SDAIRS team at work at the SDFD Emergency Command and Dispatch Center





2. Lilac Fire Perimeter Capture through the GA Aircraft and Assimilation of Perimeters into WIFIRE Fire Models



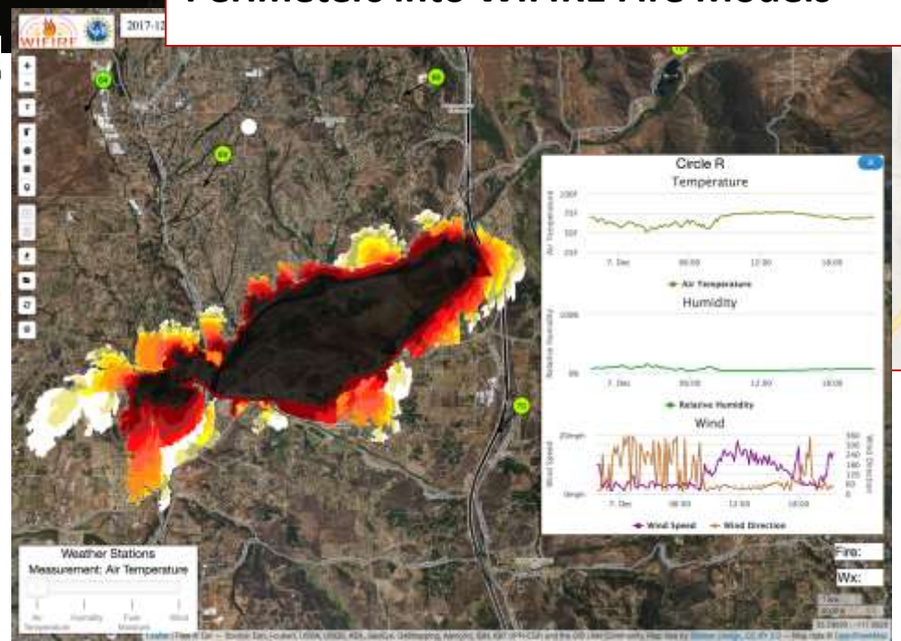
GENERAL ATOMICS AERONAUTICAL

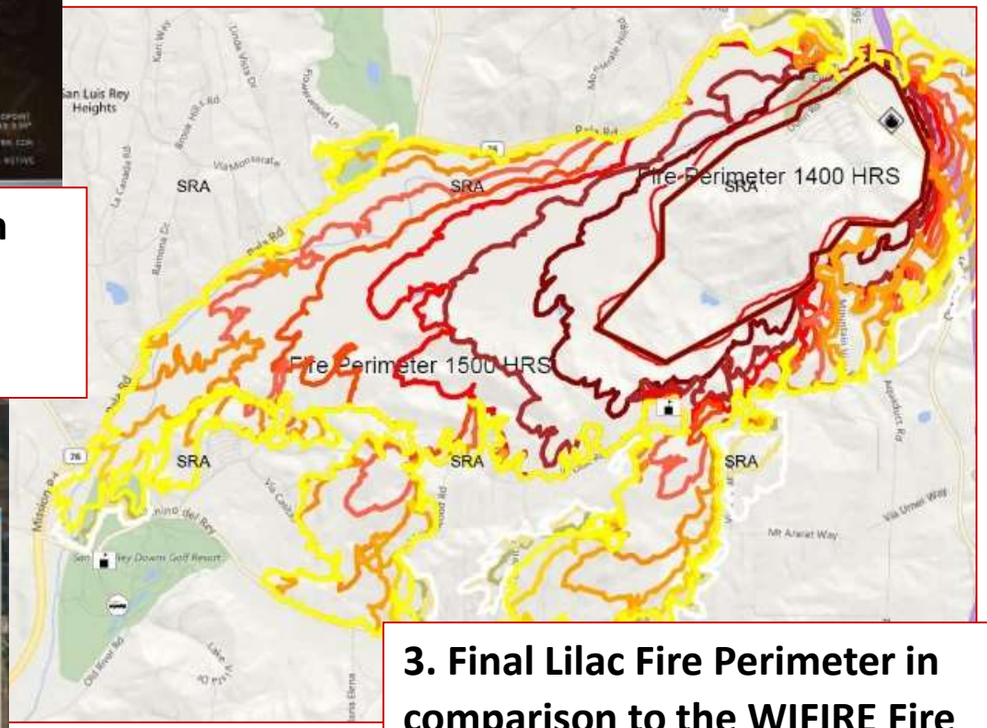
SCOUT SITUATION AWARENESS & COLLABORATION TOOL

CITY of SAN DIEGO FIRE-RESCUE

WIFIRE

UNIVERSITY OF CALIFORNIA SAN DIEGO





3. Final Lilac Fire Perimeter in comparison to the WIFIRE Fire Progression Model in SCOUT

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Pulling Together Over 600 Public/Private Participants To Craft the Path Forward

FireTechSummit

Co-hosted by: Cal OES, University of California San Diego, Public Utilities Commission State of California, Sacramento State, IBM

Select Language

ABOUT AGENDA REGISTRATION RESOURCES ACCOMMODATIONS SPONSORSHIP EMAIL SIGN-UP



"We cannot just accept devastating wildfires as the 'new normal.' California is the global leader in technology and innovation. We can develop game-changing solutions and get ahead of this problem."

-CPUC President Michael Picker

Wildfire Technology Innovation Summit

March 20-21, 2019

6000 J Street, Sacramento, CA