Jet Propulsion Laboratory
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COP21 Results and their Impact on Space Activities

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4 Pillars for Paris agreement (COP-21)

(implications on carbon data needs)

1) **Intended Nationally Determined Contributions (INDCs)**
2) Climate Finance
3) **Agreement text**
4) **Lima-Paris Action Agenda**

National level targets
[Trend Monitoring]

Accounting, reporting process
[Capacity building, Global Stocktaking]

Specific actions by key actors and sectors
[Local Mitigation Guidance]

Agriculture	Forest	Transport	Renewable Energy	Energy Access & Efficiency	Resilience
Cities & Subnationals	Private Finance	Business	Innovation	Building	Short Lived Climate Pollutants

Summary of INDCs: http://cait.wri.org/indc/

Evolution in carbon accounting: "independent verification"→ capacity building

Then (2010)

Binding Multi-national Treaty Commitments

"we will verify your reported emissions"

Multi-billion $ monitoring system, 2025+
Advocates: primarily science community

Now (2016)

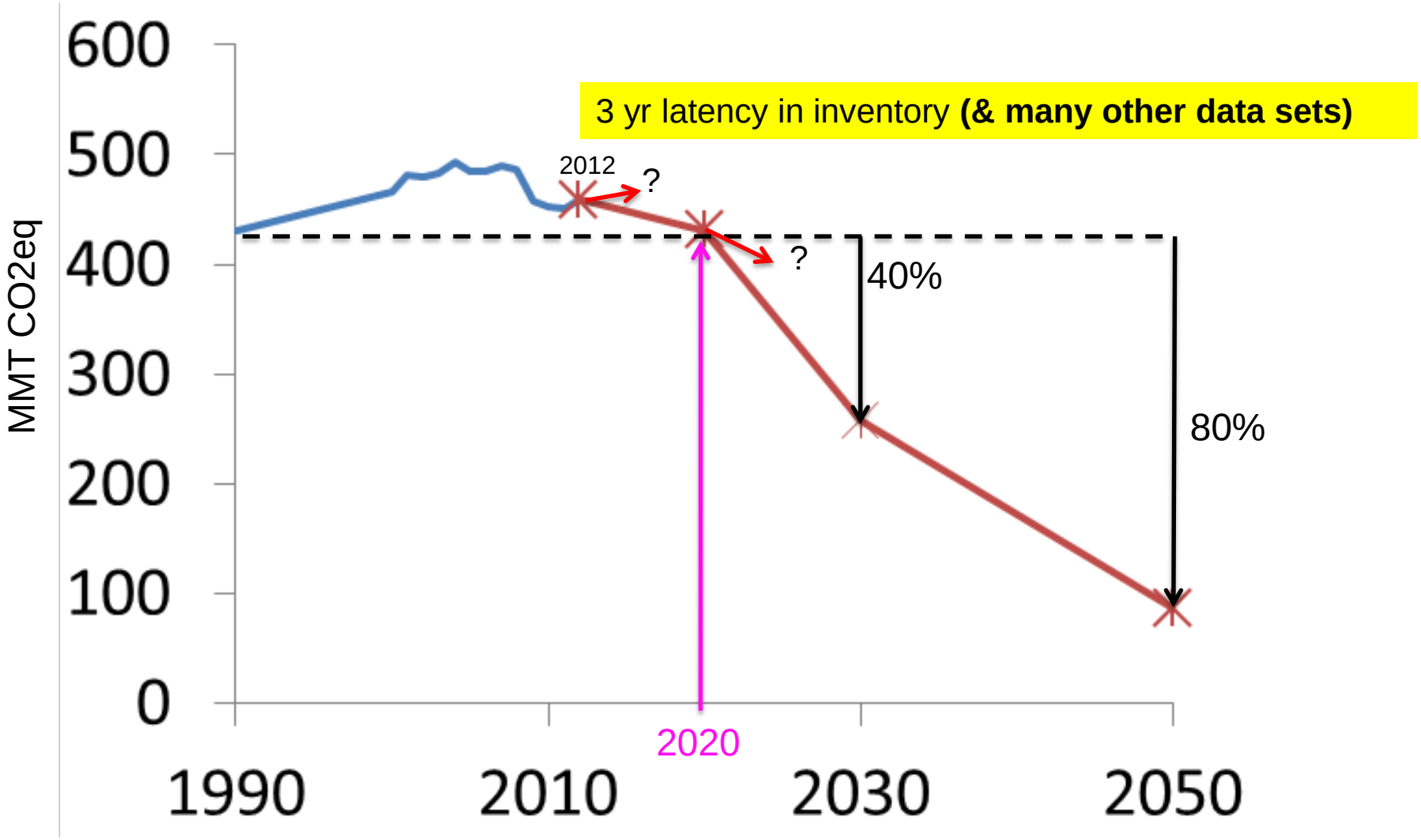
Intended Nationally Determined Contributions

"we will help you improve your data"

Federation of monitoring systems, <$1B, ~2020
Advocates: WMO (190 countries), State of California, NGOs, Industry

Trend monitoring

(managing California's ambitious CO_2 stabilization trajectory)

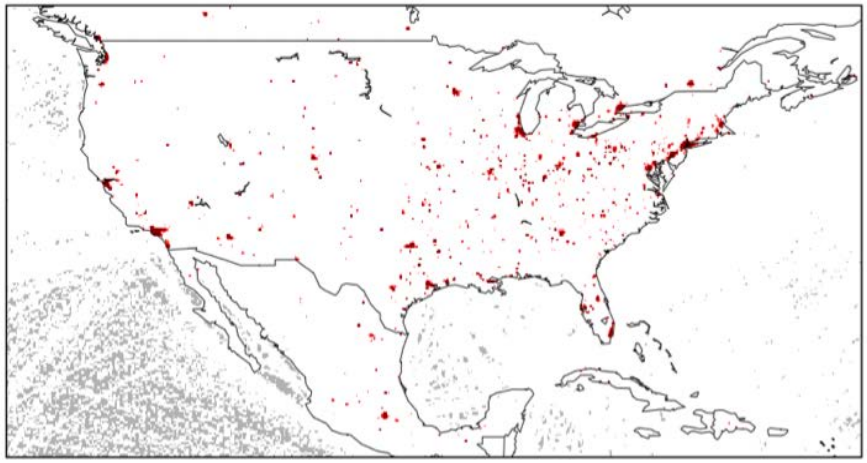


Situational awareness requires low-latency data and short-term projections

Focus on sub-national actors

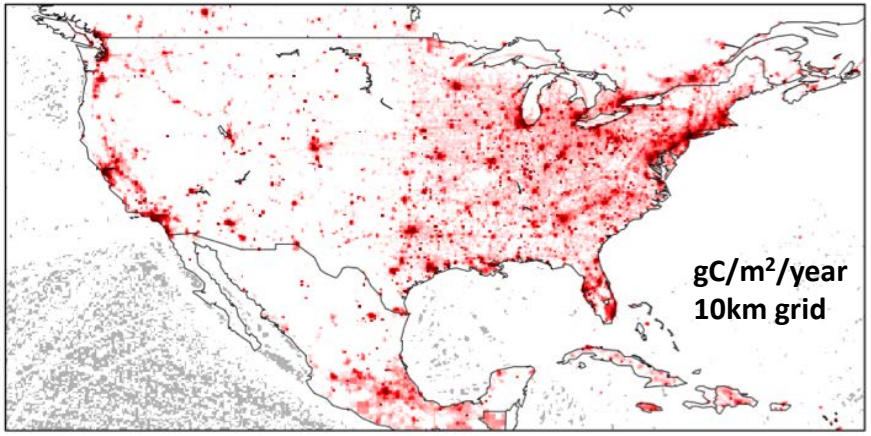
(example: fossil fuel CO2 emissions from cities)

80% of fossil CO2 emissions from <3% of



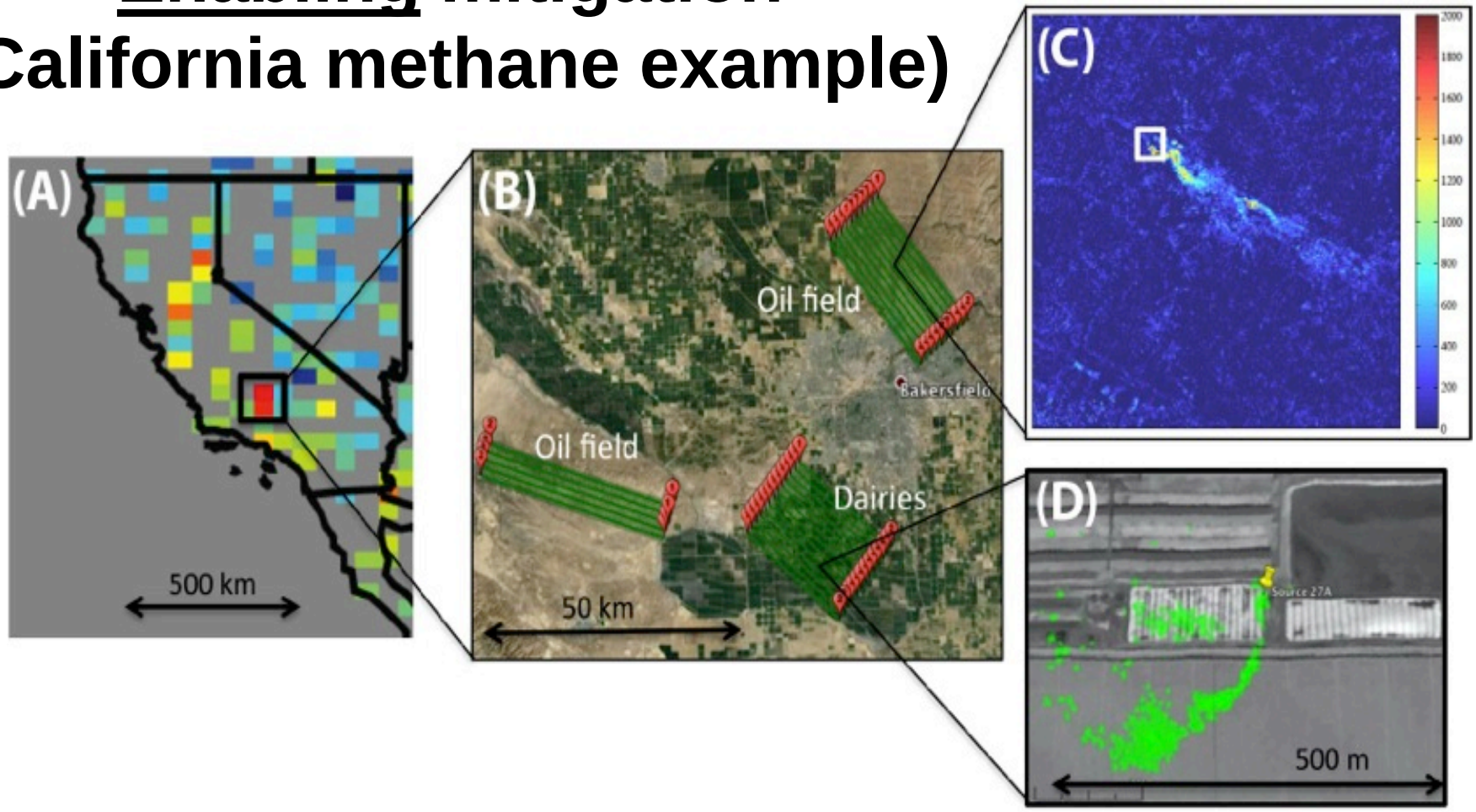
Source: FFDAS

99% of fossil CO2 emissions from 30% of land



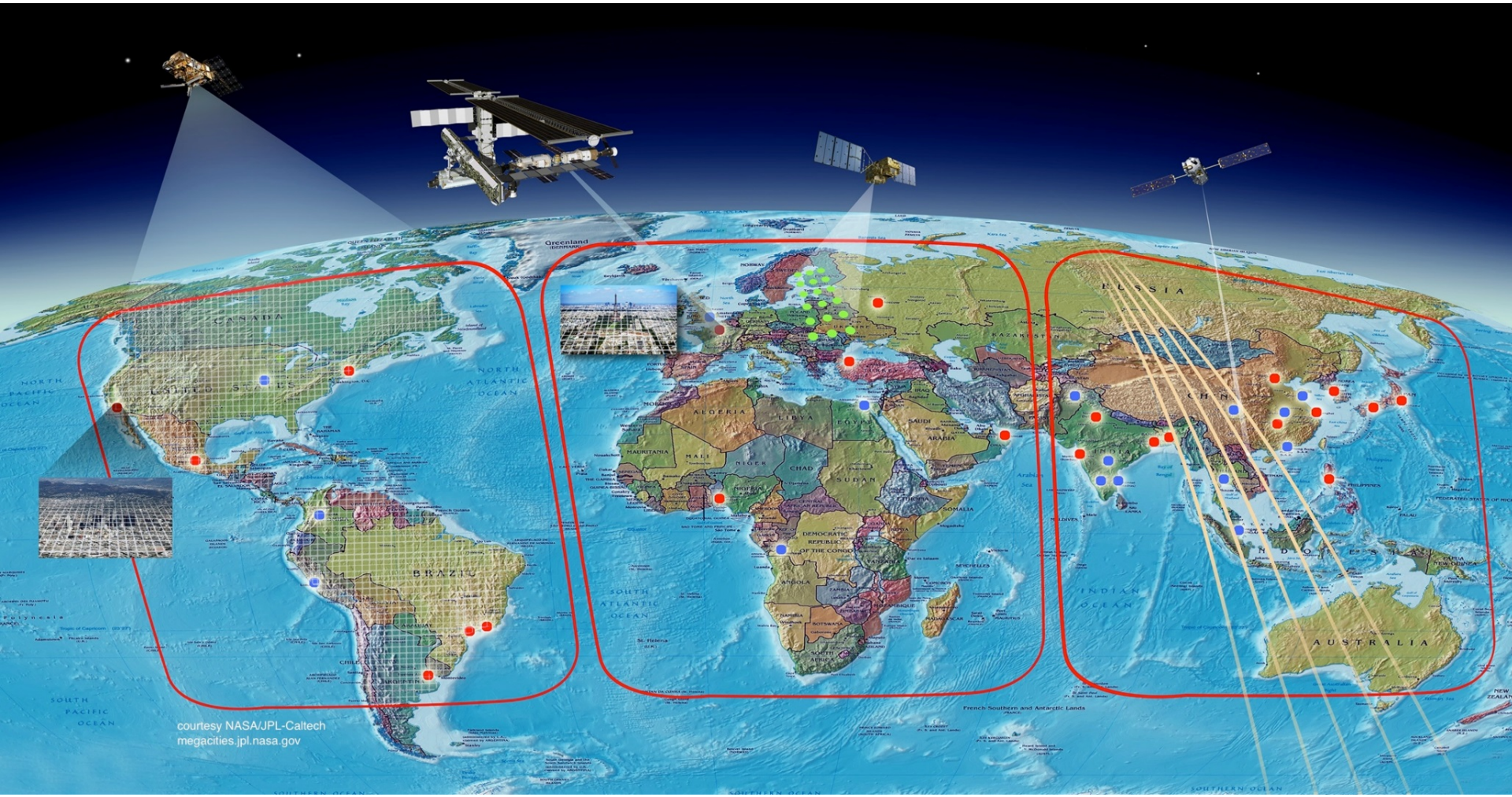
Climate 40, ICLEI

Enabling mitigation (California methane example)



Examples of tiered observational strategy for detecting methane super-emitters. (A) Methane hot spot near Bakersfield, CA detected by GOSAT from space at 2500 km^2 resolution [Turner et al., 2015]; (B) Green areas indicate focus area for recent airborne imaging spectrometer surveys (~300 km^2) of oilfields and dairies; (C) Example image of an AVIRIS-NG methane plume from a Kern River oil well; (D) Example image of a HyTES methane plume from a dairy anaerobic lagoon. Pixel scale in both images is 1.5-3 meters; both were confirmed with contemporaneous surface measurements.

Current and future carbon satellite observational strategies



Carbon monitoring from space

Carbon data type	Instrument/Technique	Example missions*
Forest disturbance/recovery	Visible imagers	Landsat series
Forest biomass	Lidar	ICESAT-2, JEDI
	InSAR	PALSAR-2, Biomass, NISAR
Fire activity	Imaging radiometers	MODIS, VIIRS, GOES I-M
Night lights, flaring activity (energy proxies)	Imaging radiometers	VIIRS
Regional CO2 emissions, removals	Grating spectrometers, Fourier Transform Spectrometers	GOSAT, OCO-2, OCO-3, TanSat, Microcarb
Regional CH4 emissions	Grating spectrometers, Fourier Transform Spectrometers, Lidar	GOSAT, Sentinel-5P/TROPOMI, Merlin
CH4 point source activity	Hyperspectral imaging spectrometers	EnMAP

*current and planned mission only; proposed missions not shown

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