

A faint, light blue topographic map of Western Mexico is visible in the background of the slide. The map shows the terrain of the region, including the Sierra Madre Occidental and the Gulf of California.

# Bridging Local Data Gaps in Western Mexico

An LLM-Integrated Framework using GEOS-CF for  
Automated Air Quality Diagnostics

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**Institution:** Universidad de Guadalajara

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# Universidad de Guadalajara: Institutional Powerhouse

**342,000+**

**Enrolled Students.** The second largest public university system in Mexico, driving unparalleled social mobility.

**Constitutionally Autonomous**

Ensuring independent research continuity, geographic scale, and operational agility for binational campaigns.

**156** **Postgraduate Programs**

A deep well of CONAHCYT-recognized advanced academic and engineering talent.



# THE JALISCO SENSOR NETWORK (GROUND TRUTH)

## SITE SECURITY

Fenced, guarded government property preventing physical sensor vandalism.

## INFRASTRUCTURE

Independent power supplies and continuous high-speed university internet for unbroken telemetry.

## GEOGRAPHIC REACH

The U de G has 177 campuses distributed in 110 of the 125 municipalities of the state of Jalisco. And 9 university centers outside the AMG.

## MAINTENANCE

On-site academic staff and engineering students for rapid sensor calibration and upkeep.

# Strategic Topographies for Diverse Climate Validation



## Coastal & Oceanic Interaction

**Campuses:** CUCosta (Puerto Vallarta), CUCSur

**Validation Focus:** Hurricane tracking, Pacific moisture transport, and complex coastal thermal dynamics.



## Complex Urban & Valley Dynamics

**Campuses:** CUCEI, CUCEA, CUTonalá

**Validation Focus:** Ideal for validating urban heat islands, thermal inversions, ultrafine particle (UFP) dispersion, and vehicle emission signatures across the Guadalajara Megalopolis.



## Highland & Agricultural Corridors

**Campuses:** CUAltos, CUSur, CUCiénega

**Validation Focus:** Agricultural meteorology, drought risk assessment, and soil moisture tracking.

# IAM: A Century of Meteorological Authority



## Heritage

Institute of Astronomy and Meteorology (IAM), founded 1889, integrated into UdeG in 1925. First Latin American member of the Global Alliance of Historical Observatories.



## The Baseline

Maintaining continuous, unbroken meteorological data collections for Guadalajara dating back to 1881. The definitive historical baseline for modern climate change models in the region.

# Active Infrastructure & Public Communication



## Active Doppler Radar

Tracking severe weather and mesoscale convective systems across Western Mexico.



## Automated Weather Stations

A proprietary ground-level network recording high-resolution temporal data.

22.7°C  
Temperature

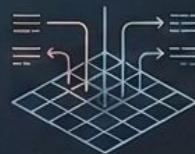
55.8%  
Humidity

3.6 mph  
Wind speed



## Daily Weather Forecasts & Public Alerting

Generating and disseminating daily weather forecasts for Jalisco through local television, radio, newspapers, and official social media channels to keep the public informed and safe.



## Numerical Modeling & Forecasting

Operational WRF model forecasting ([www.udg.mx/wrf](http://www.udg.mx/wrf))

01:02:06  
Data Transfer  
1.928 Mi/s

6.256  
Data Transfer

# Translating Data into Regional Resilience



## Civil Security

Operating early warning tracking systems to protect a state population of over 8 million citizens from extreme weather.

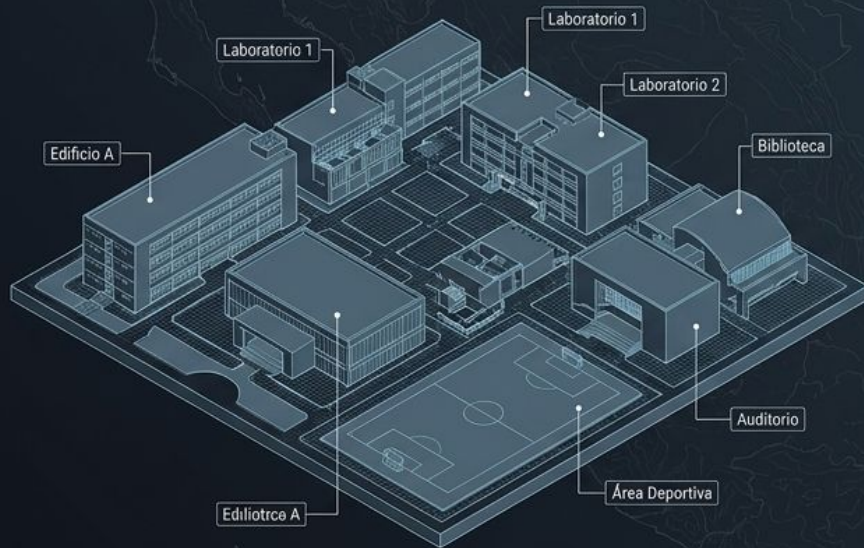
## Agricultural Optimization

Delivering vital climate advising and drought risk management in one of Mexico's most critical agro-industrial states.

## Environmental Health

Analyzing thermal inversions, NO<sub>2</sub>, and PM<sub>2.5</sub>/PM<sub>10</sub> pollutant dispersion to directly inform public health interventions.

# CUCEI: Technological Support & Next-Gen Talent



The University Center of Exact Sciences and Engineering (CUCEI) is the technological motor of the UdeG network. It provides the human capital and advanced engineering required to actively maintain and calibrate IoT environmental monitoring grids.

**14,000+**

Enrolled students in exact sciences and engineering.

**133**

Specialized active laboratories.

**18**

Quality postgraduate programs.

# CADS: Heavy Computational Infrastructure

Reorganizing for Data Science at Scale

## Institutional Backing

Dictamen Núm. IV/2025/121 recently centralized the Center for Data Analysis and Supercomputing (CADS) into a transversal framework supporting advanced scientific research across all campuses.

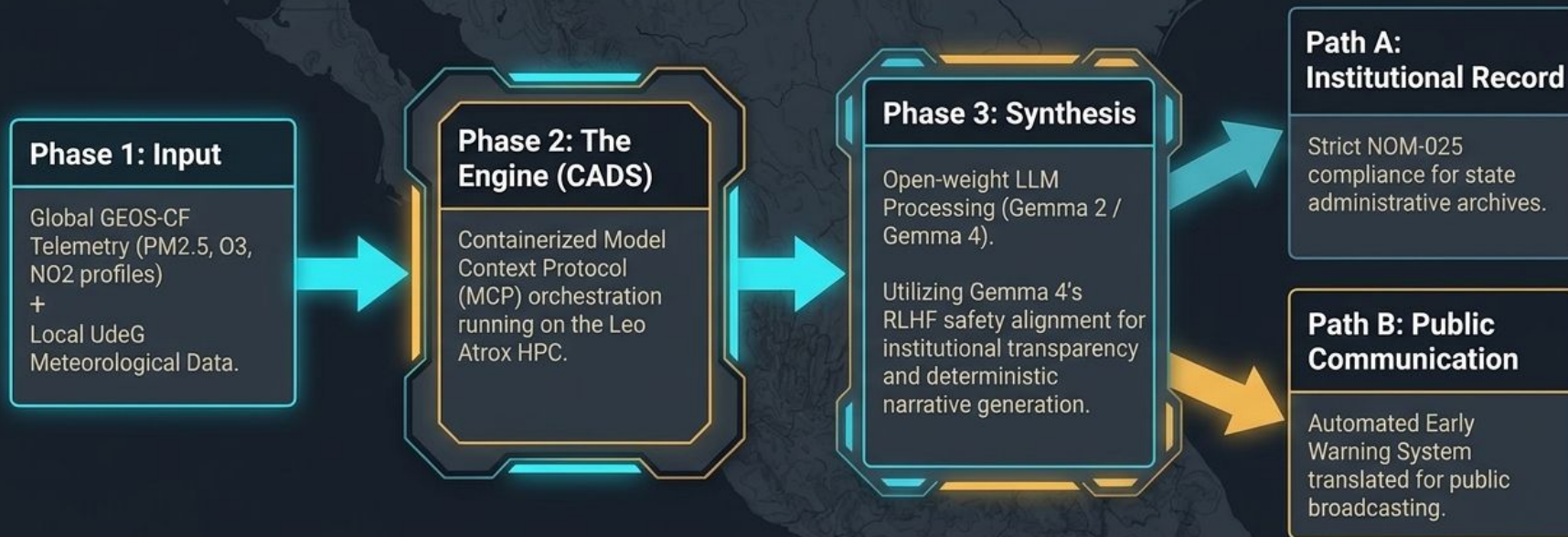
## Hardware Engine

Powered by the robust 'Leo Atrix' HPC supercomputer cluster, designed for massive data ingestion and assimilation of global satellite models.

## Execution Environment

Utilizing an interoperable containerized approach (Apptainer/Singularity) on login nodes to bypass traditional public university root-access bottlenecks, ensuring uninterrupted daily processing of GEOS-CF data.

# Active Test Site: GEOS AMG



Live Validation Site: [https://bit.ly/geos\\_amg](https://bit.ly/geos_amg)

# YOUR GROUND TRUTH IN WESTERN MEXICO

Universidad de Guadalajara provides the massive geographic scale, the exact engineering talent from CUCEI, and the unbroken historical authority of the IAM to validate the future of global climate science. We actively welcome international collaboration campaigns, joint atmospheric research projects, sensor deployments, and funding initiatives. Let's build resilience together.

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