



Research Group TIC168
in Computational
Instrumentation and
Industrial Electronics
(ICEI)

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1. Introduction to TIC168 Research Group
2. Research Group Members
3. Main Research Areas
4. Research Group Achievements
5. Our Laboratory





□ GENERAL RESEARCH LINE

COMPUTATIONAL INTELLIGENCE FOR MEASUREMENT SYSTEMS AND APPLICATIONS

□ RESEARCH LINE IN THE DOCTORATE PROGRAM IN ENERGY ENGINEERING AND SUSTAINABILITY

APPLIED TECHNOLOGY FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY



Dr. JUAN JOSÉ
GONZÁLEZ DE LA ROSA
(HEAD)



Dr. AGUSTÍN
AGÜERA PÉREZ



Dr. JOSÉ CARLOS
PALOMARES SALAS



Dr. JOSÉ MARÍA
SIERRA FERNÁNDEZ



Dra. OLIVIA
FLORENCIAS OLIVEROS



Dr. MANUEL JESÚS
ESPINOSA GAVIRA



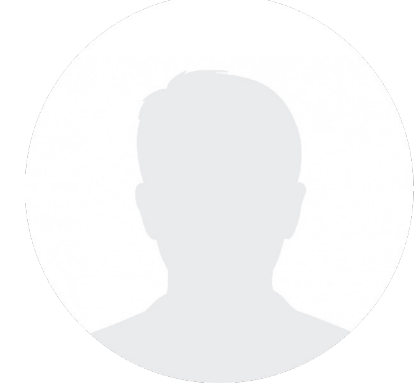
MSc. PAULA
REMIGIO CARMONA



Dr. ANTONIO
ILLANA MARTOS



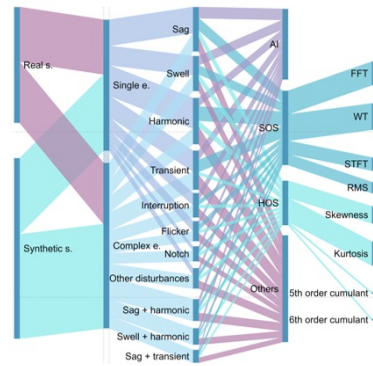
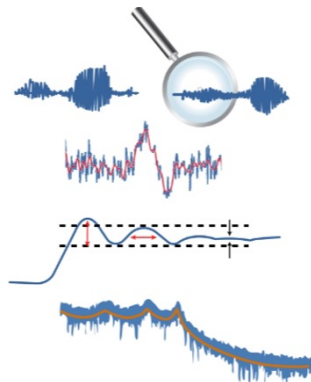
MSc. FRANCISCO JOSÉ
GUTIÉRREZ VILLALBA



Dra. MANUELA
VILCHEZ VILCHEZ

Power Quality

- **Monitoring** of the electrical network (V, I, f and waveform) in different supply points.
- Development of methods and **quality indicators** of electrical supply.
- Exploratory data analysis and visualization methods for **energy information**.
- Development of **intelligent real-time power quality analysis instruments**.

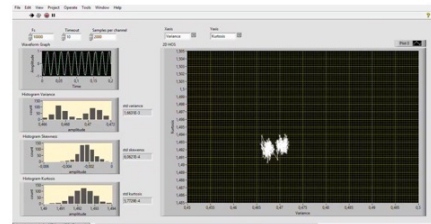
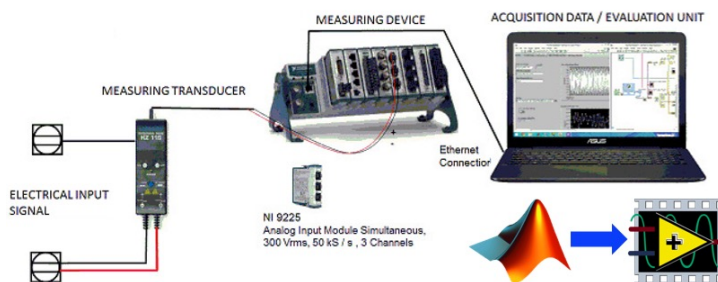


Sensor Networks and Intelligent Instrumentation

- Development of multipurpose **IoT sensor networks** and capability analysis.
- Development of intelligent measurement instruments.
- Edge computing, self-calibration and self-diagnosis in sensor networks.

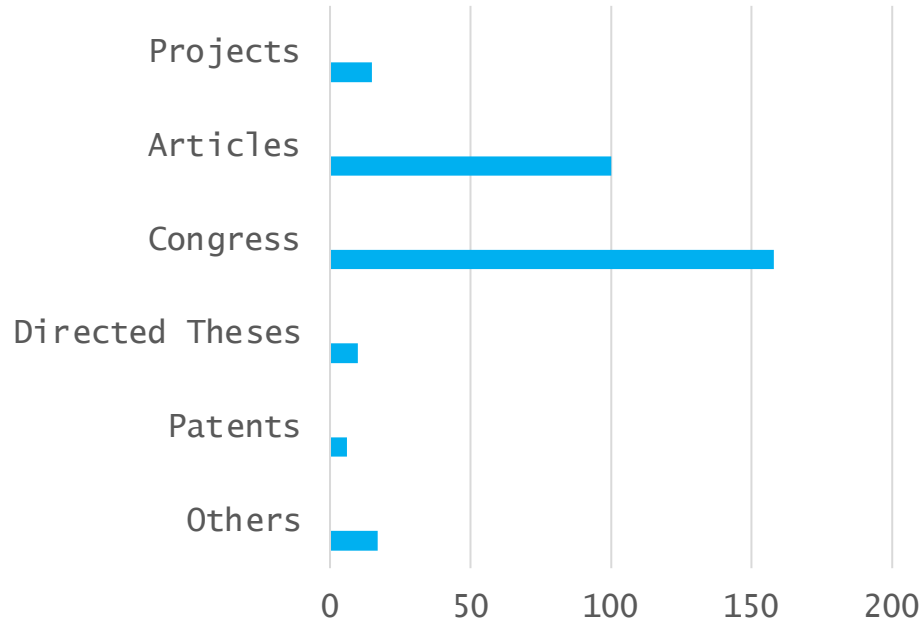
Meteorology applied to Renewable Energy and Demand

- **Monitoring** and estimation of renewable potential using nowcasting techniques.
- Characterizations of energy production and demand for different meteorological scenarios.
- Energy management based on weather predictions.

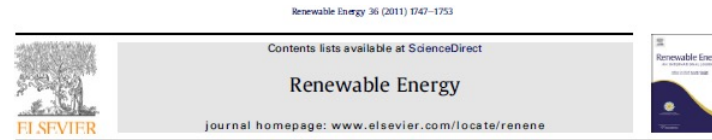


Big Data and Smart Cities, Infrastructure and Buildings

- Instrumentation for monitoring infrastructure and buildings.
- Instruments and techniques of Industry 4.0.
- Big-data applications for energy management in buildings (maintenance, acclimatization, security, parking,...).

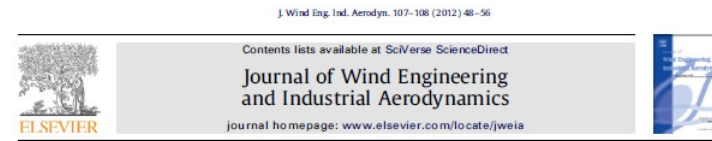


- 100 papers in high impact JCR journals
- Communications in 158 international and national conferences
- Direction/participation in 15 projects at different scale



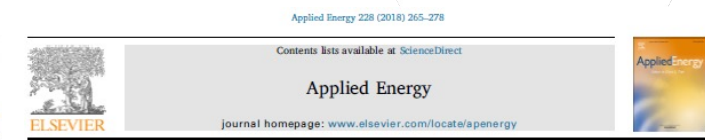
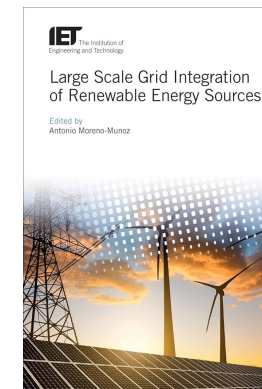
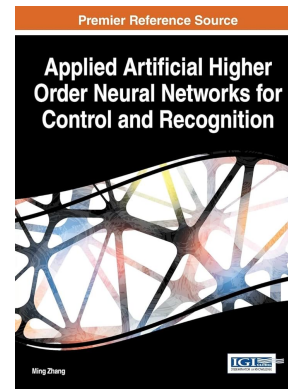
A novel inference method for local wind conditions using genetic fuzzy systems
 Juan José González de la Rosa ^{a,b,*,1}, Agustín Agüera Pérez ^{a,b}, José Carlos Palomares Salas ^{a,b}, José Gabriel Ramiro Leo ^{a,b}, Antonio Moreno Muñoz ^{a,c}

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Basic meteorological stations as wind data source: A mesoscalar test [☆]
 Agustín Agüera-Pérez ^{a,b,*}, José Carlos Palomares-Salas ^{a,b}, Juan José González de la Rosa ^{a,b,1}, José Gabriel Ramiro-Leo ^{a,b}, Antonio Moreno-Muñoz ^{a,c}

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Weather forecasts for microgrid energy management: Review, discussion and recommendations
 Agustín Agüera-Pérez^{*}, José Carlos Palomares-Salas, Juan José González de la Rosa¹, Olivia Florencias-Oliveros

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Forecasting PM₁₀ in the Bay of Algeciras Based on Regression Models

José Carlos Palomares-Salas ^{*,†}, Juan José González-de-la-Rosa [†], Agustín Agüera-Pérez [†], José María Sierra-Fernández [†] and Olivia Florencias-Oliveros [†]

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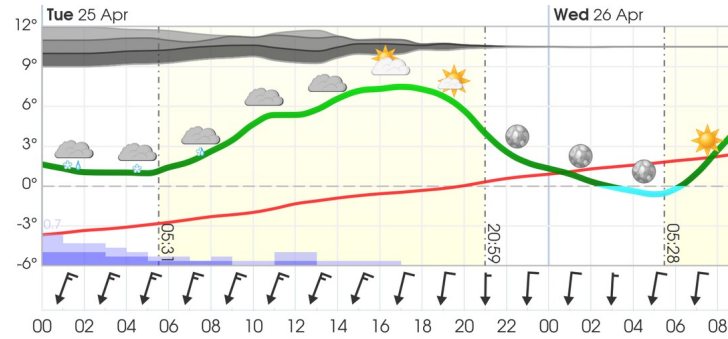
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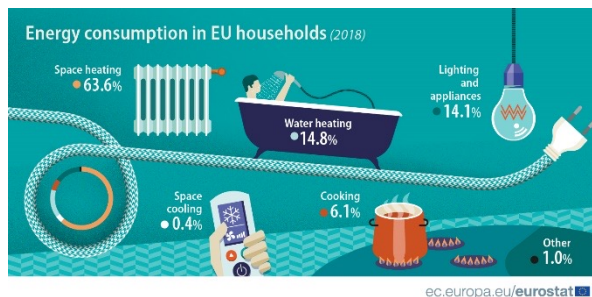


INFORMATION SUPPLY FOR ENERGY MANAGEMENT SYSTEM



WEATHER:

- Renewable generation
- Load profiles



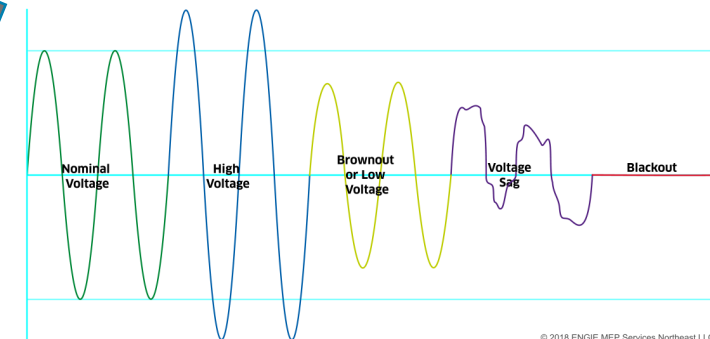
DEMAND:

- Behavior patterns
- Buildings occupancy
- Demand response



ECONOMIC:

- Energy price
- Market operations



ELECTRIC:

- System stability
- Power quality

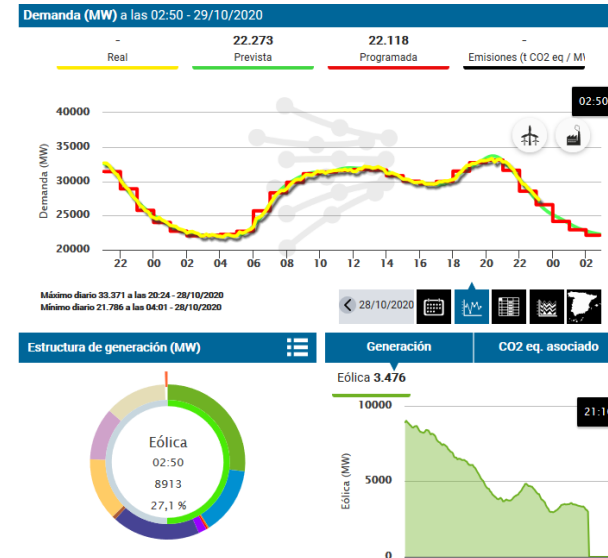
METEOROLOGICAL DATA: VARIABLES

- WIND**
- Wind speed
 - Wind direction

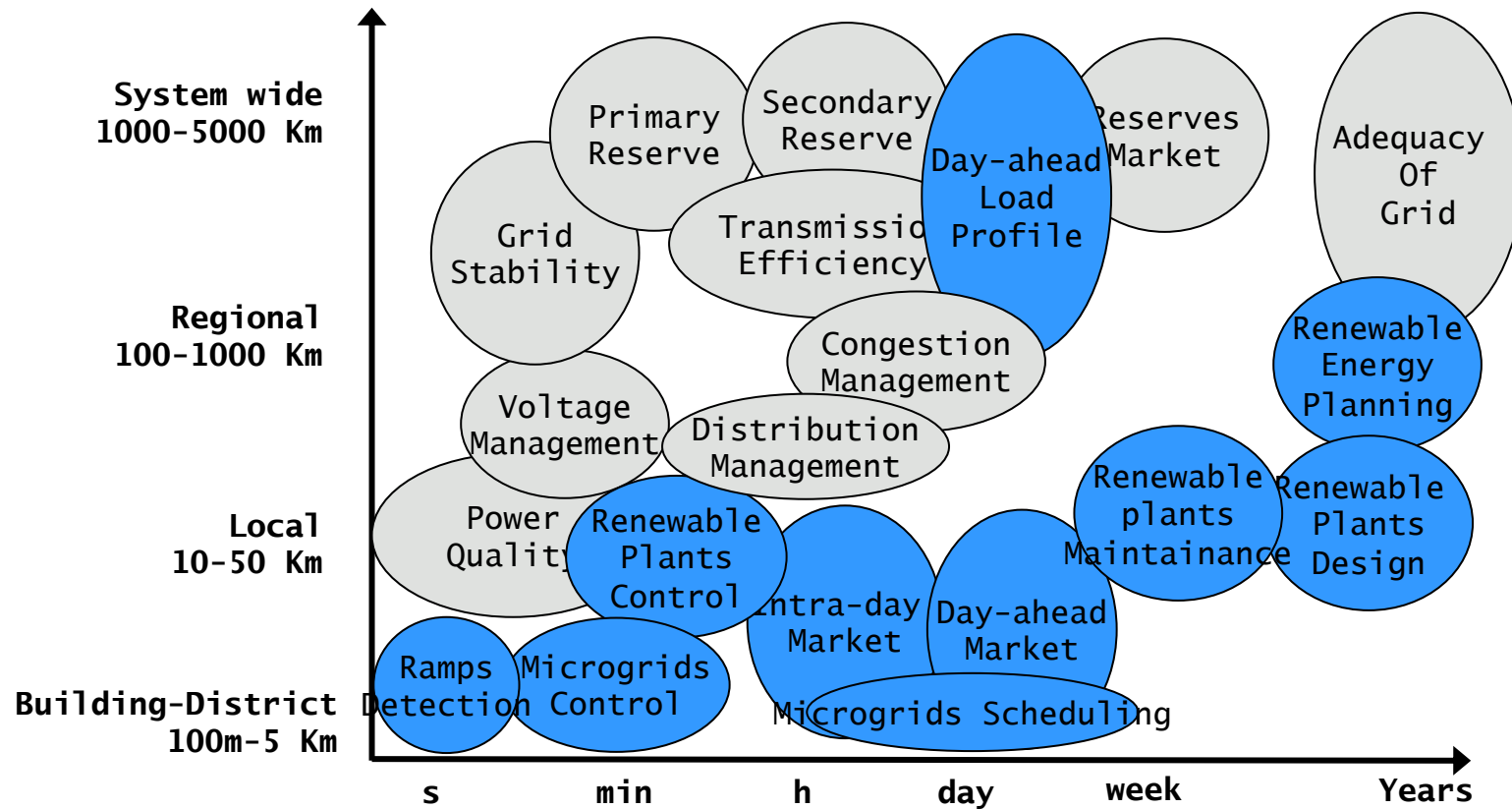


- SOLAR**
- Irradiance
 - Temperature

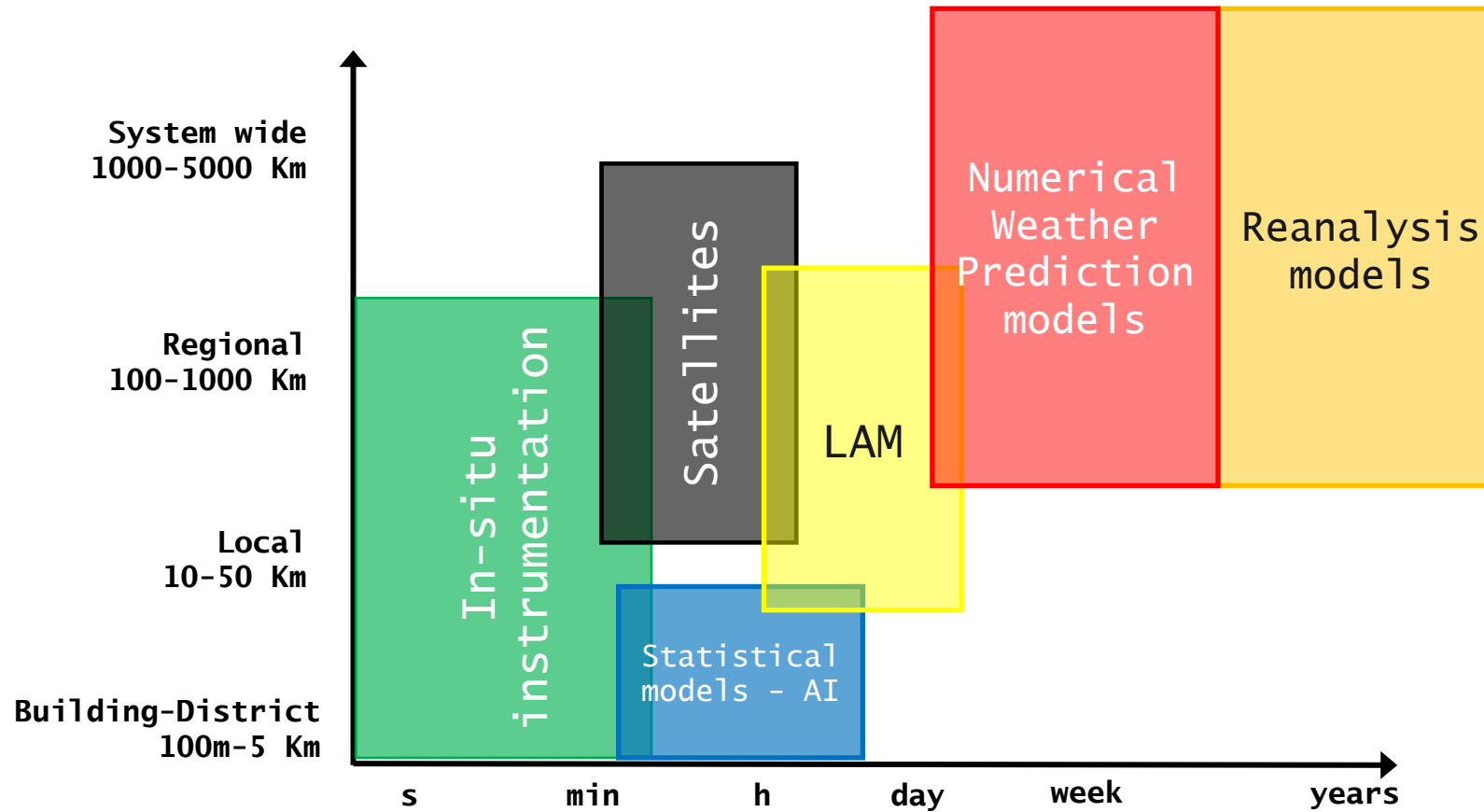
- DEMAND**
- Temperature
 - Humidity
 - Irradiance



GRID OPERATIONS BASED ON METEOROLOGICAL DATA



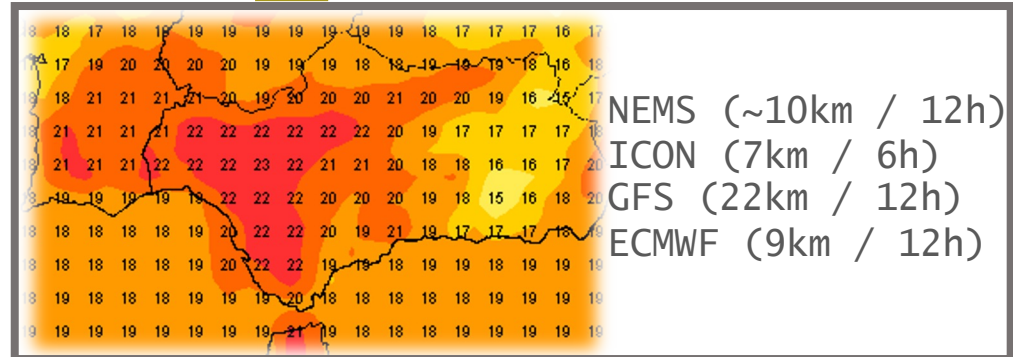
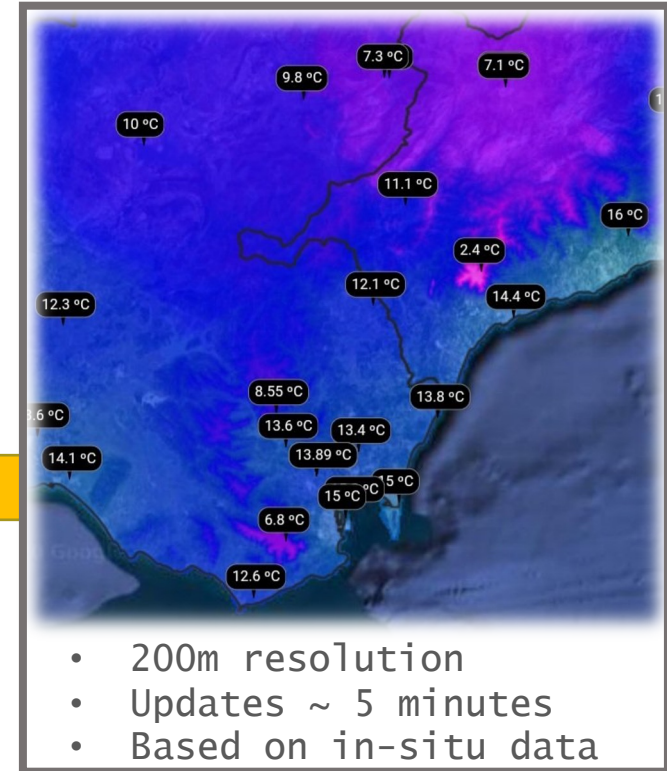
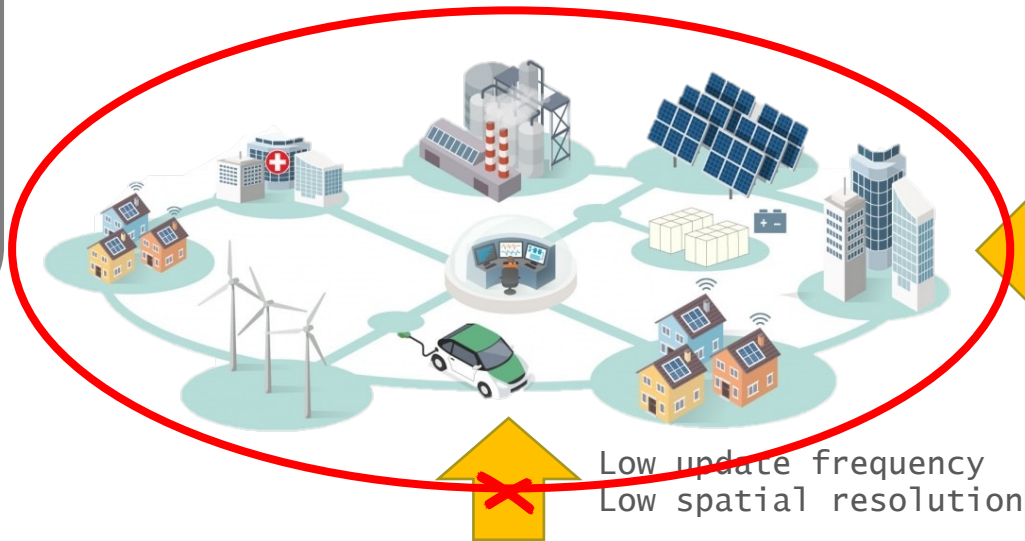
METEOROLOGICAL DATA SOURCES



JUSTIFICATION OF LOCAL WEATHER SERVERS

Challenges

- Delegation of control to smaller entities
- Need for near real-time data
- Complexity, high economic and computational cost for small entities

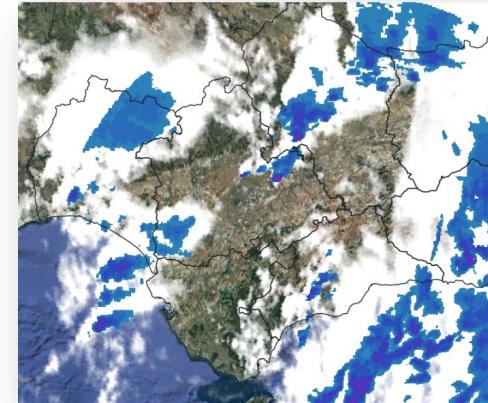


MeteoCdG: Campo de Gibraltar Weather Data Server

- Real-time data from stations:
 - AEMET (45)
 - Puertos del Estado (14)
 - SIAR (44)
 - SAIH Hidrosur (72)
 - METAR (6)
 - Puertos de Andalucía (12)
 - TIC168-UCA (6)
- Radar reflectivity processing
- Meteosat and Metop satellite imagery processing
- Online geographic information system
- Algorithms developed in previous projects

Future:

- Local weather forecasts based on AEMET and GFS forecasts..
- Virtual stations
- Data quality control
- Ramp and extreme event alarm



MeteoCdG

<https://meteoCdG.uca.es>

MeteoCdG as Local Weather Data Server

