

# Research on Solar Magnetism at IRSOL

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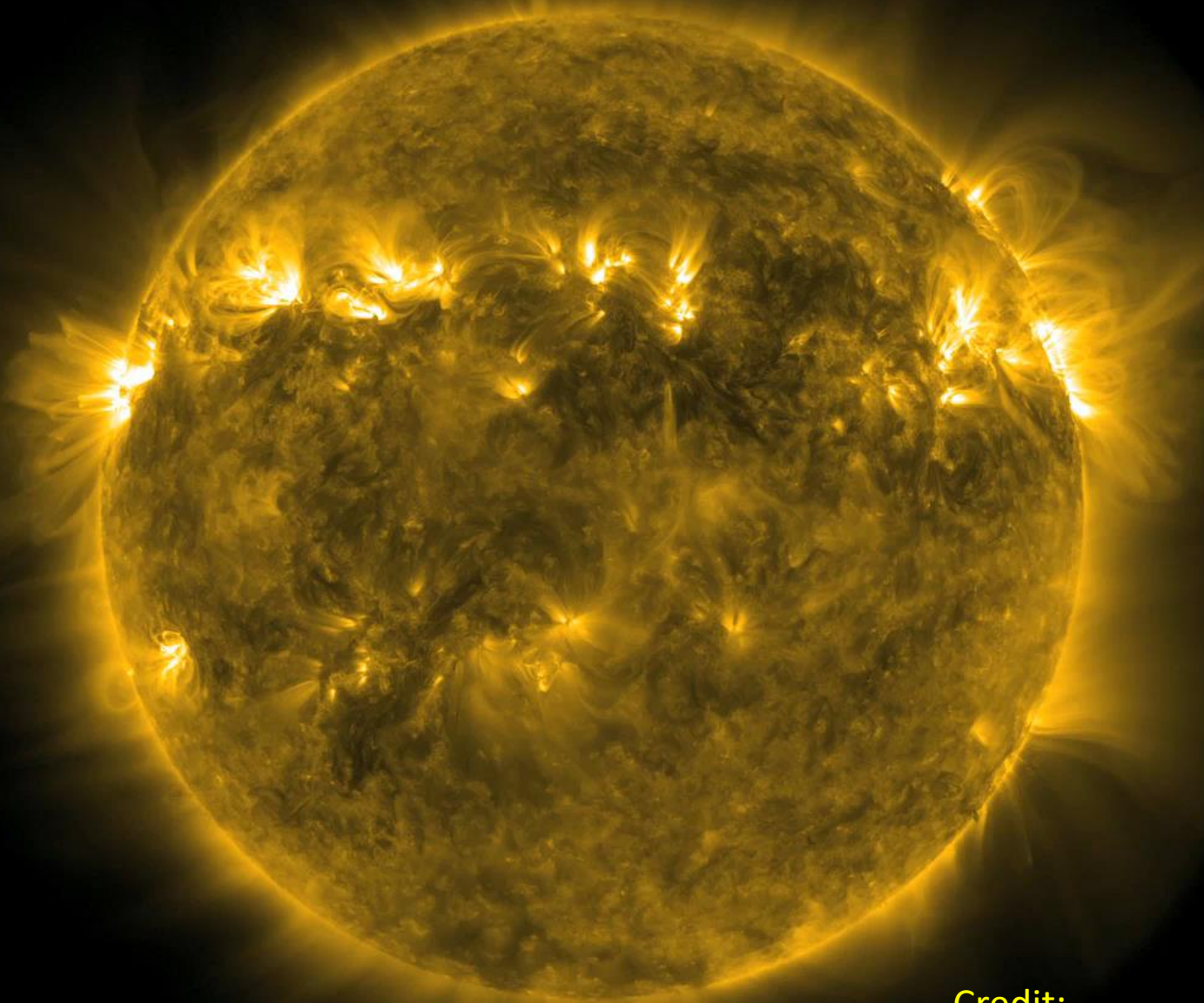
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# IRSOL



- **IRSOL** = Istituto Ricerche Solari «Aldo e Cele Daccò» in Locarno
- Affiliated to **USI**
- Research focus: **solar spectropolarimetry** (visible)  
→ **solar magnetism**

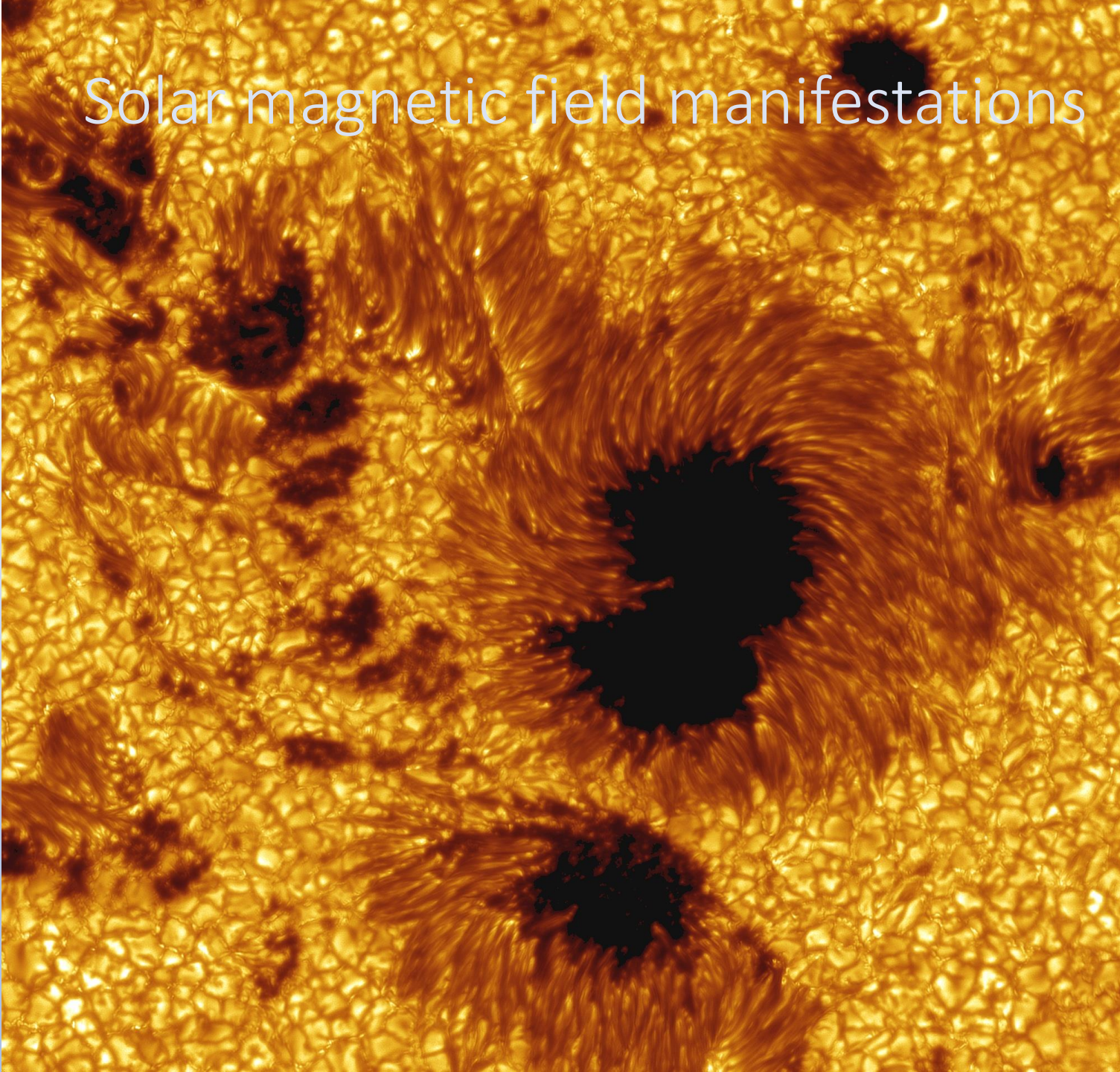
# Solar magnetic field manifestations



Credit:  
NASA/SDO



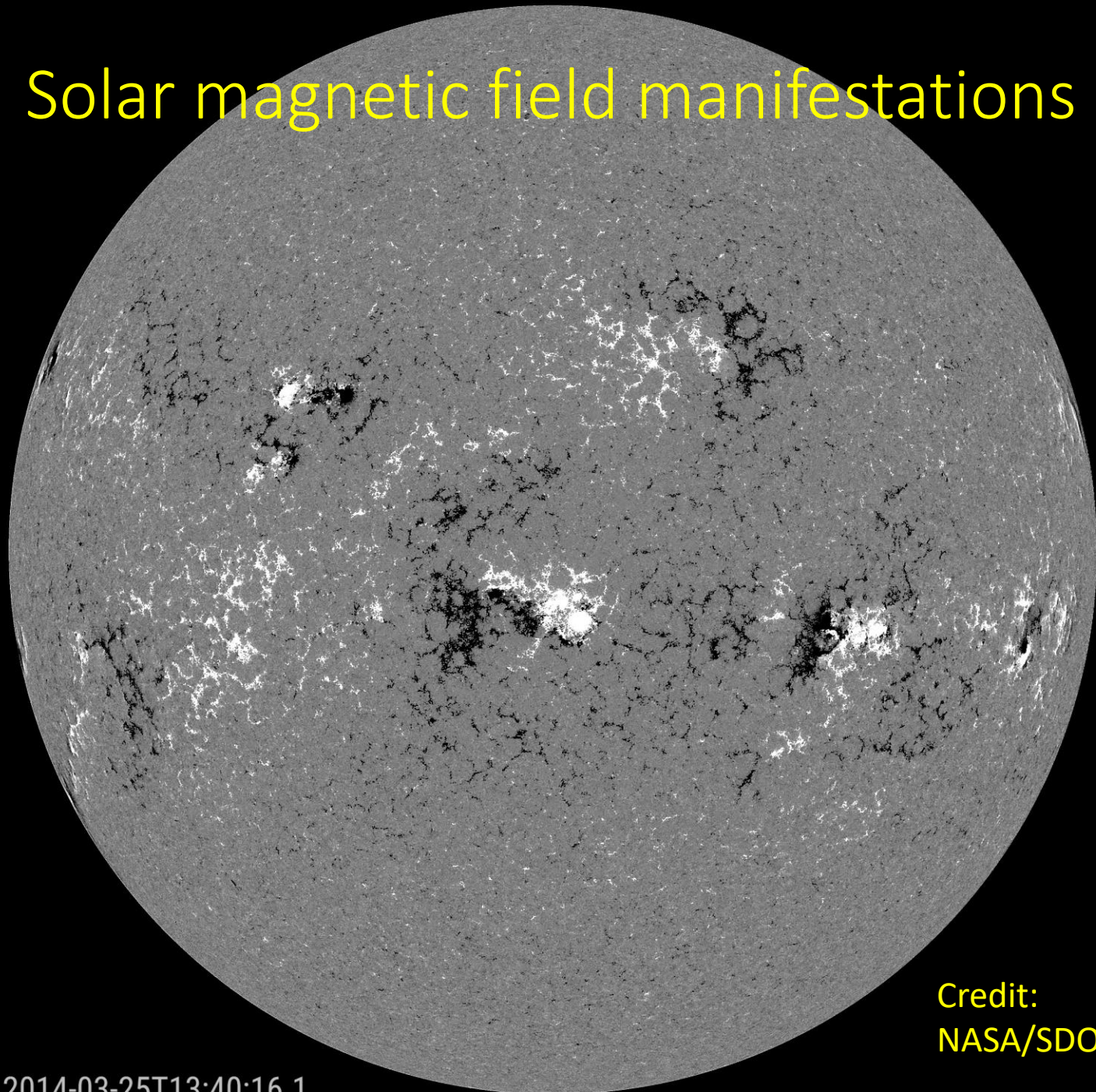
# Solar magnetic field manifestations



Credit:  
SST, La Palma



# Solar magnetic field manifestations

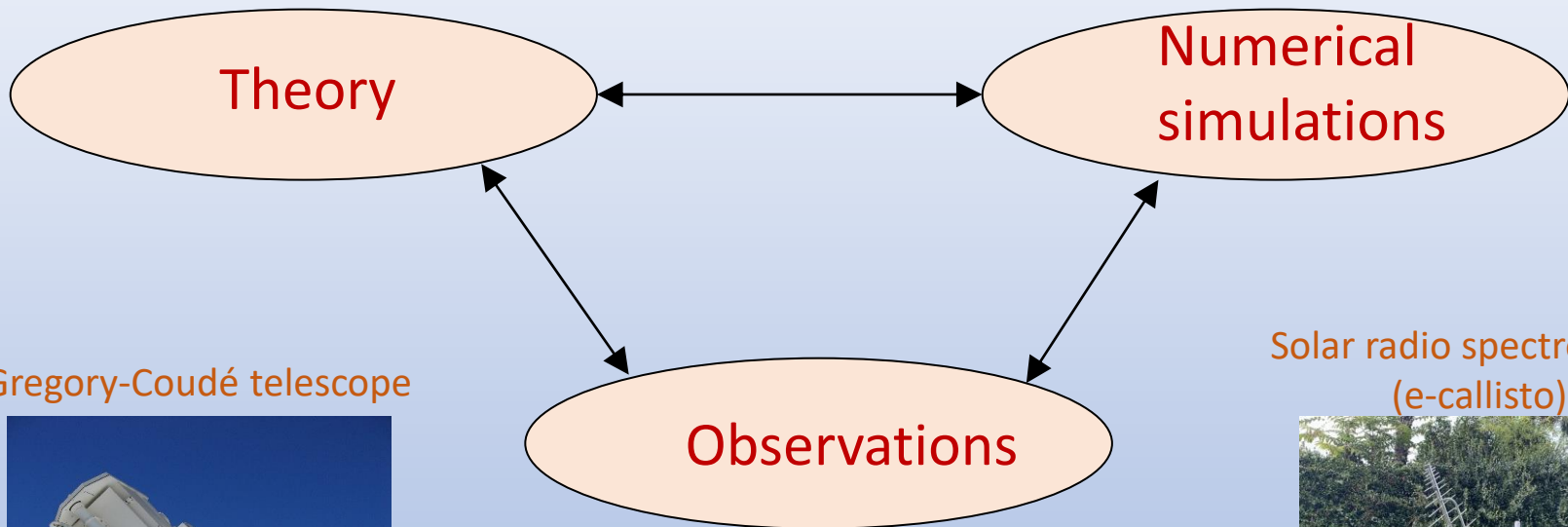


Credit:  
NASA/SDO

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# IRSOL

Team: 14 scientific collaborators



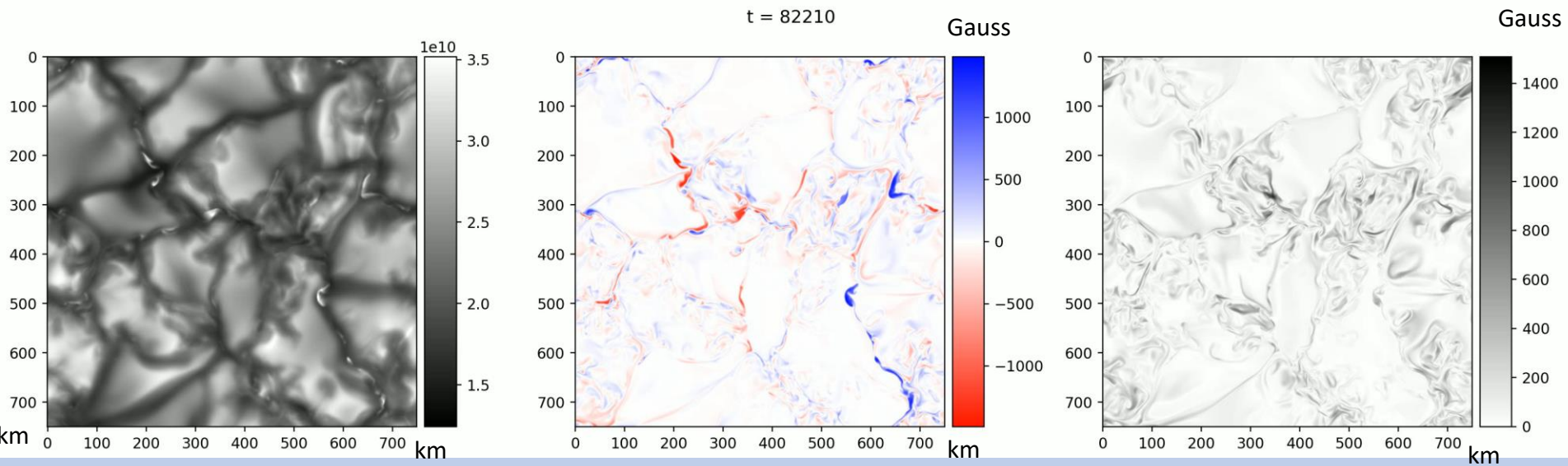
Gregory-Coudé telescope



Solar radio spectrometer (e-callisto)



# Example of numerical simulation



Intensity

Longitudinal magnetic field

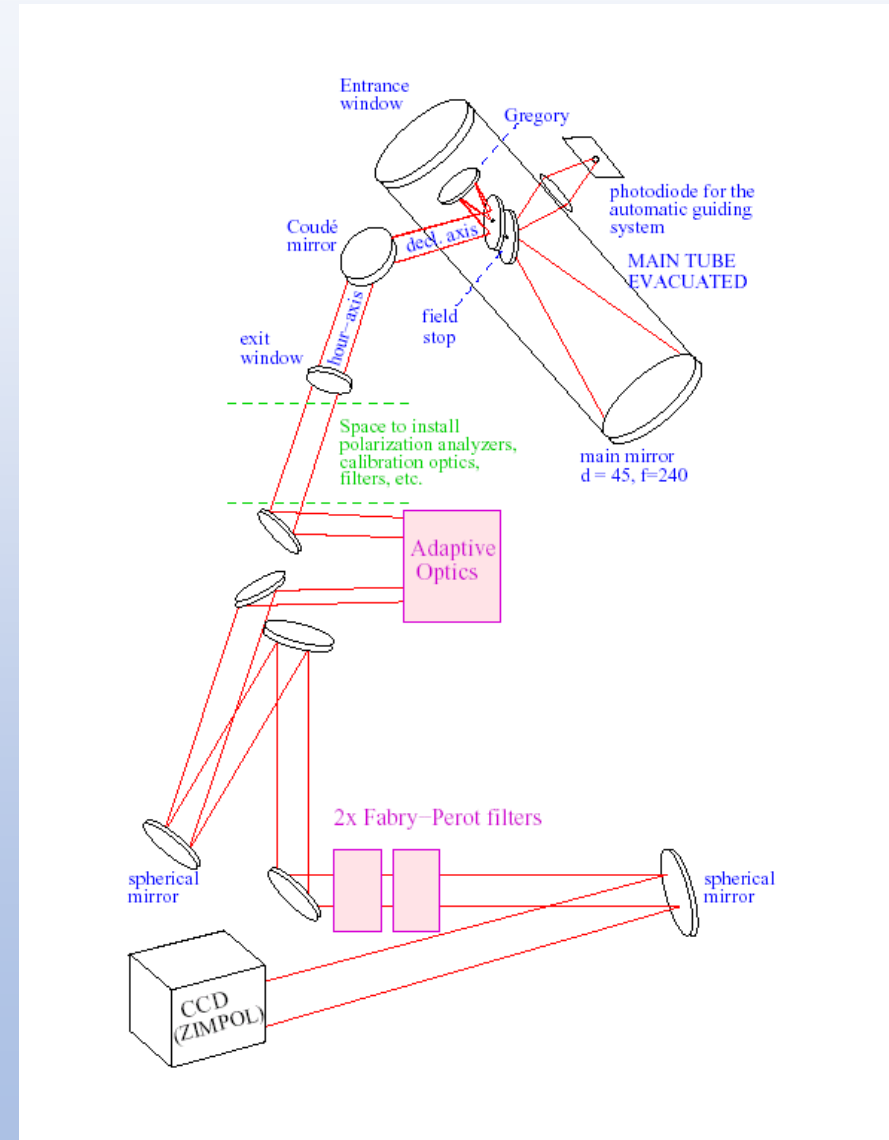
Transversal magnetic field

Courtesy: Fabio Riva, IRSOL.

Simulation @ CSCS

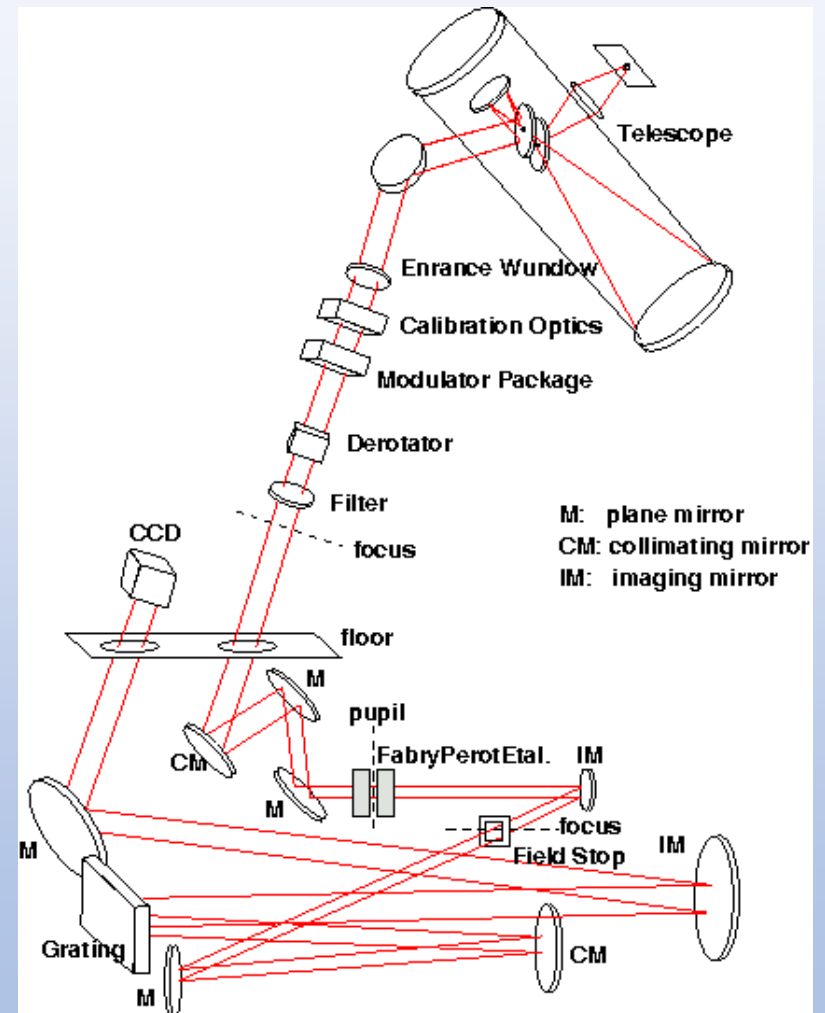


# Instrumental setup at IRSOL



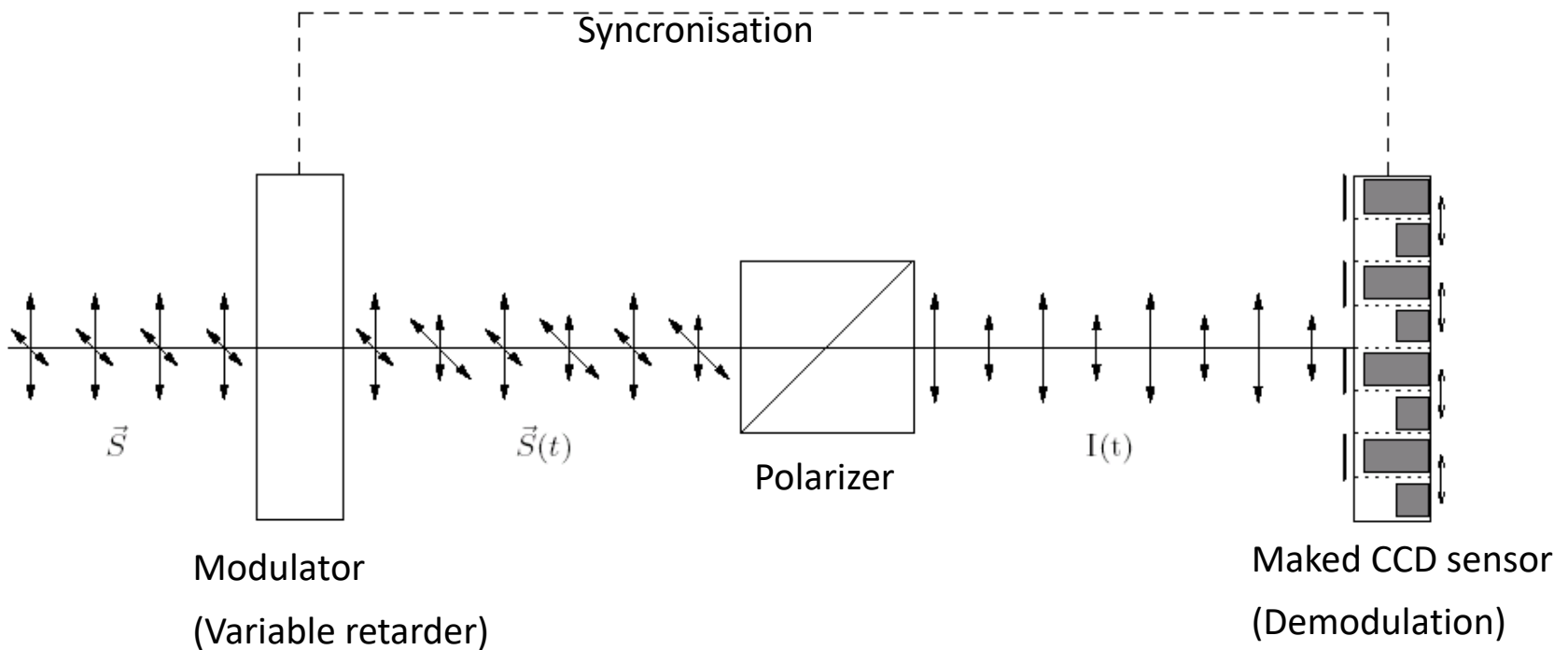


# The instrumental setup at IRSOL

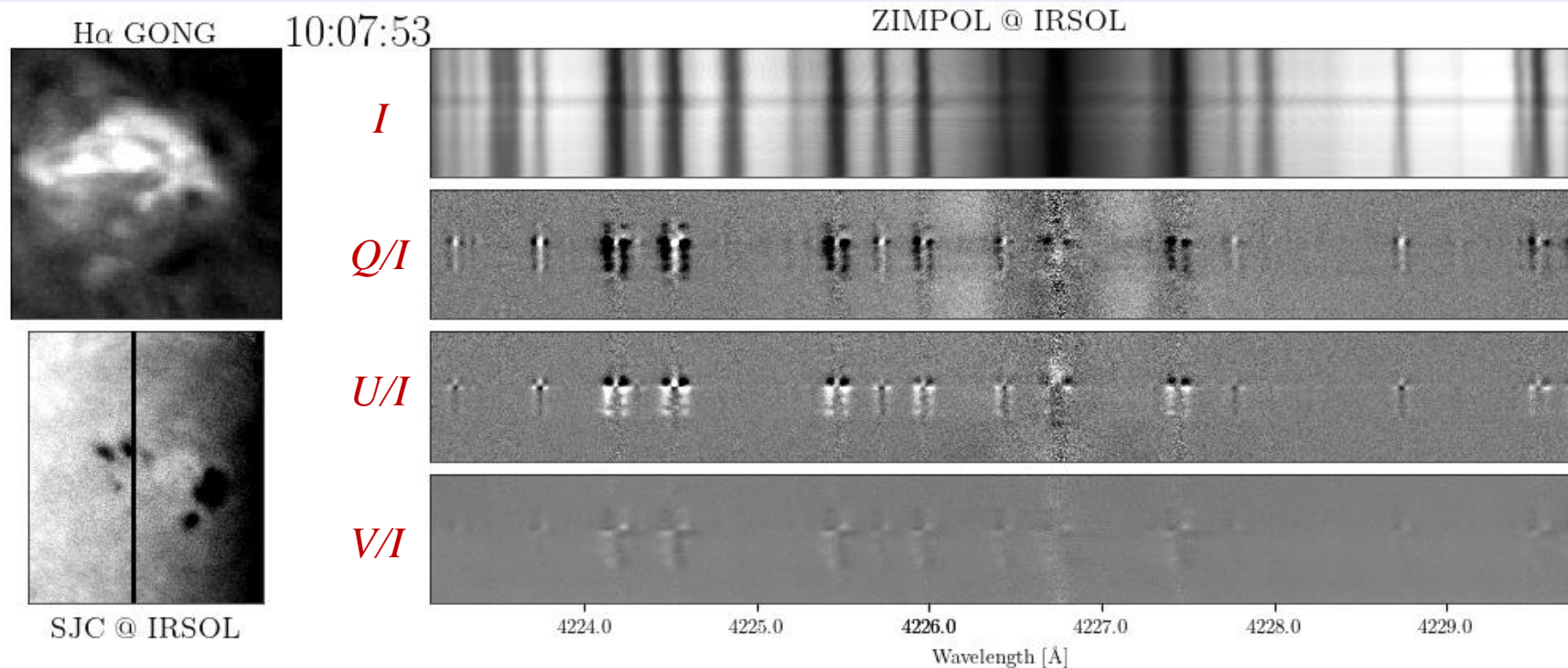


# ZIMPOL polarimeter

- Fast modulation (1kHz-42kHz) allows observations almost free from seeing induced crosstalks (error dominated by photon noise statistics)
- Max. precision  $\sim 10^{-5}$
- ZIMPOL development carried out in collaboration with SUPSI, Lugano

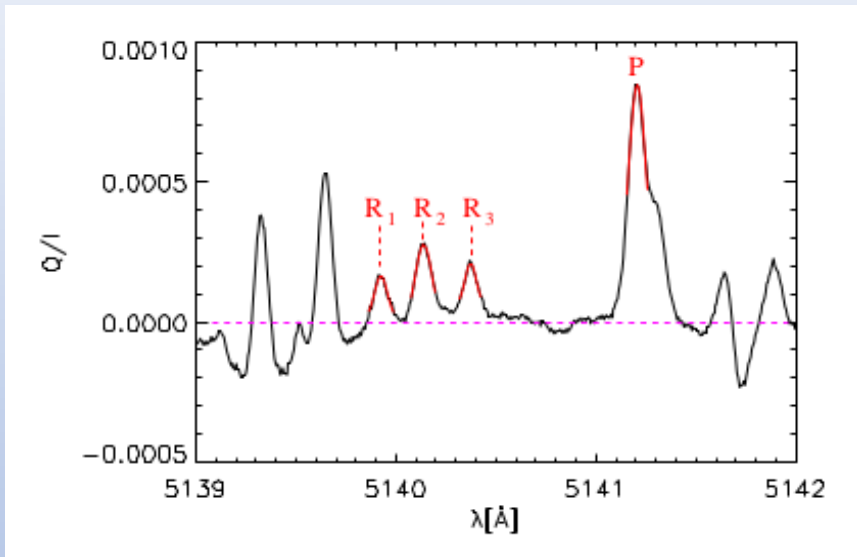


# Zeeman effect by strong magnetic fields in sunspots





# Scattering polarization at solar limb: example of C2 molecular lines



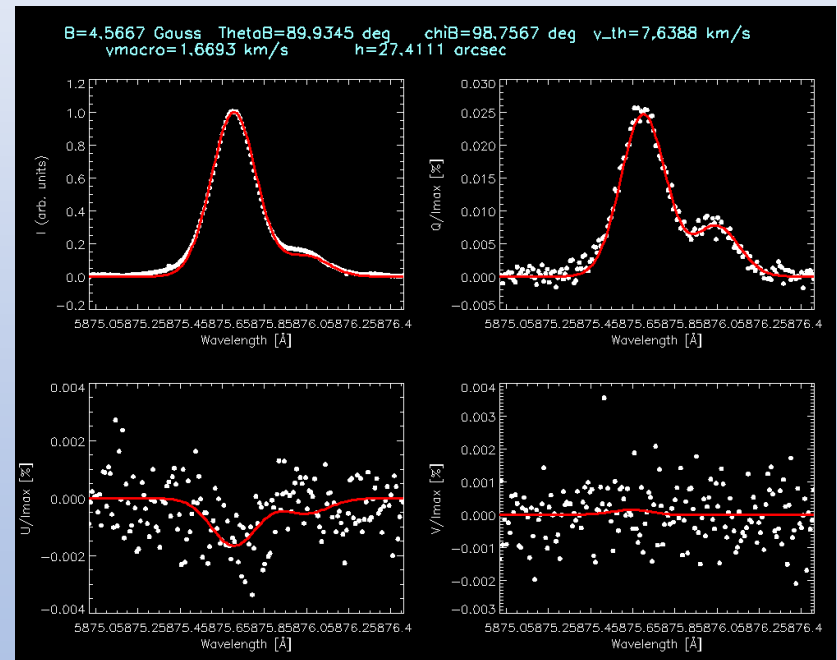
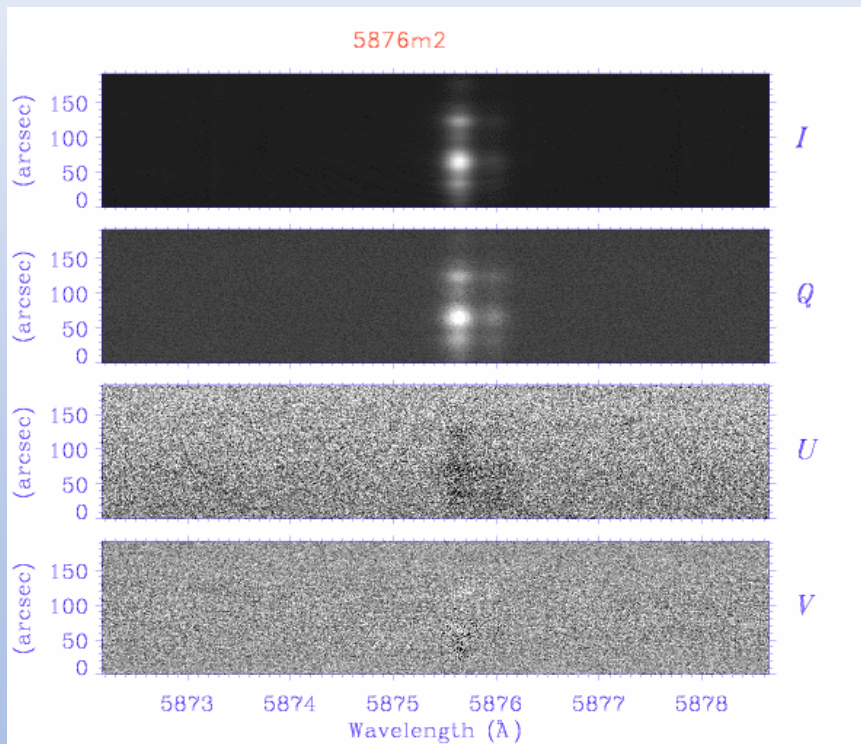
- Polarized signal amplitude modified by unresolved (turbulent) magnetic field (**Hanle effect**)
- Each line has different sensitivity to the magnetic field (**differential Hanle effect**)

## Scientific goals:

- Exploring possible variations of the small-scale unresolved fields with the solar cycle
- obtaining information on the physical origin of these fields

# Examples of scientific observation programs

## Example of prominence observations in He D3 and inversion

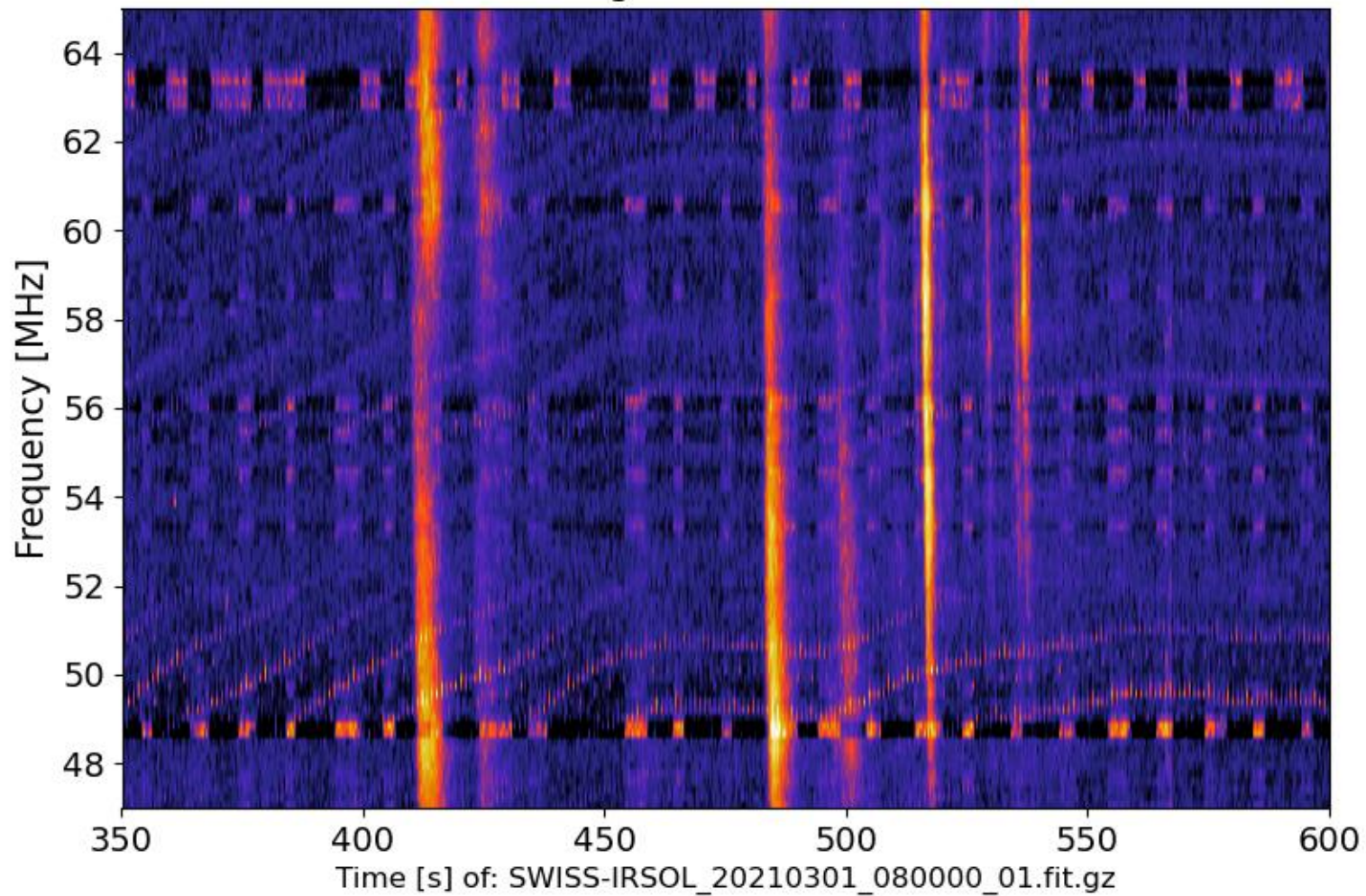


# Concluding remarks / highlights

- High precision spectropolarimetry allows to unveil **small scale magnetic field** structure
- IRSOL activity → **3 pillars**: observations, theory and numerical simulations
- Key instrument: **ZIMPOL polarimeter** (precision  $10^{-5}$ )
- Campaigns organized at **major telescopes** (ex. Gregor)
- Development of **new observing techniques** and instrumentation to **enhance precision and accuracy**
- Participation in new **major international projects** for ground based solar telescopes  
(e.g. consortium for the **European Solar Telescope (EST)** project - 4m)



# 1st light Callisto IRSOL



## 2nd light Callisto IRSOL

