

Research program “Observational Astrophysics”

presented by
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Observational Astrophysics

- Current status and research topics
- Methods and tools
- Relations with other astronomy programs
- Future goals and practical steps

Current status and research topics

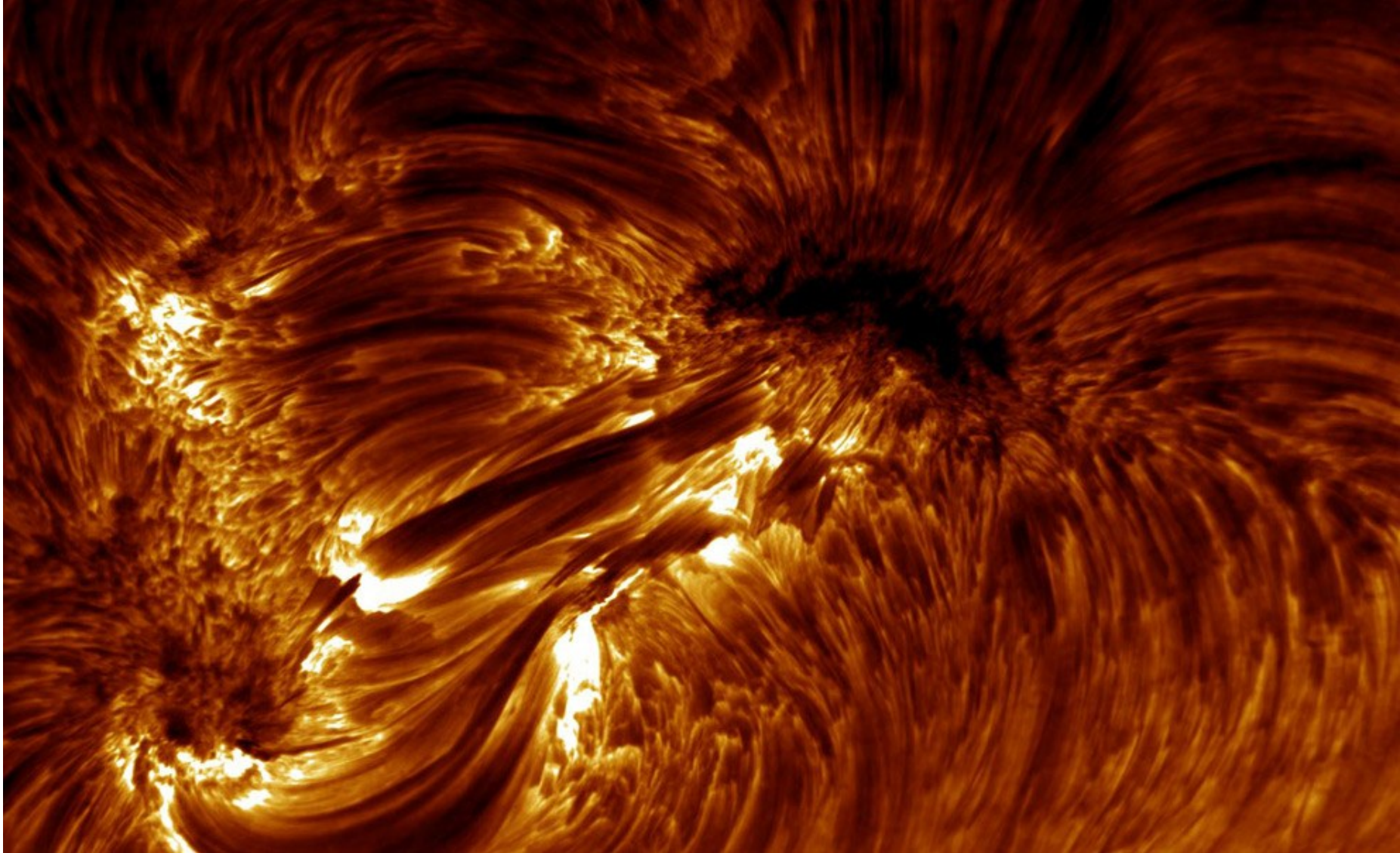
- 6-7 senior scientists and postdocs
- 7 PhD students
- UU: 4719 kSEK
- External grants (VR, SNSB, KVA, KAW, EU): 10767 kSEK

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- Solar system, space plasma and the Sun
 - Stars and circumstellar medium
 - Exoplanets
 - Magnetic fields
 - Galaxies

Solar system, space plasma and the Sun

- History of solar system:
 - Water delivery to the inner planets
- Space plasma:
 - Rings of Saturn – proxy for proto-planetary disks
- The Sun:
 - Dynamics, magnetic fields and energy transport

The Sun: dynamics and magnetic fields



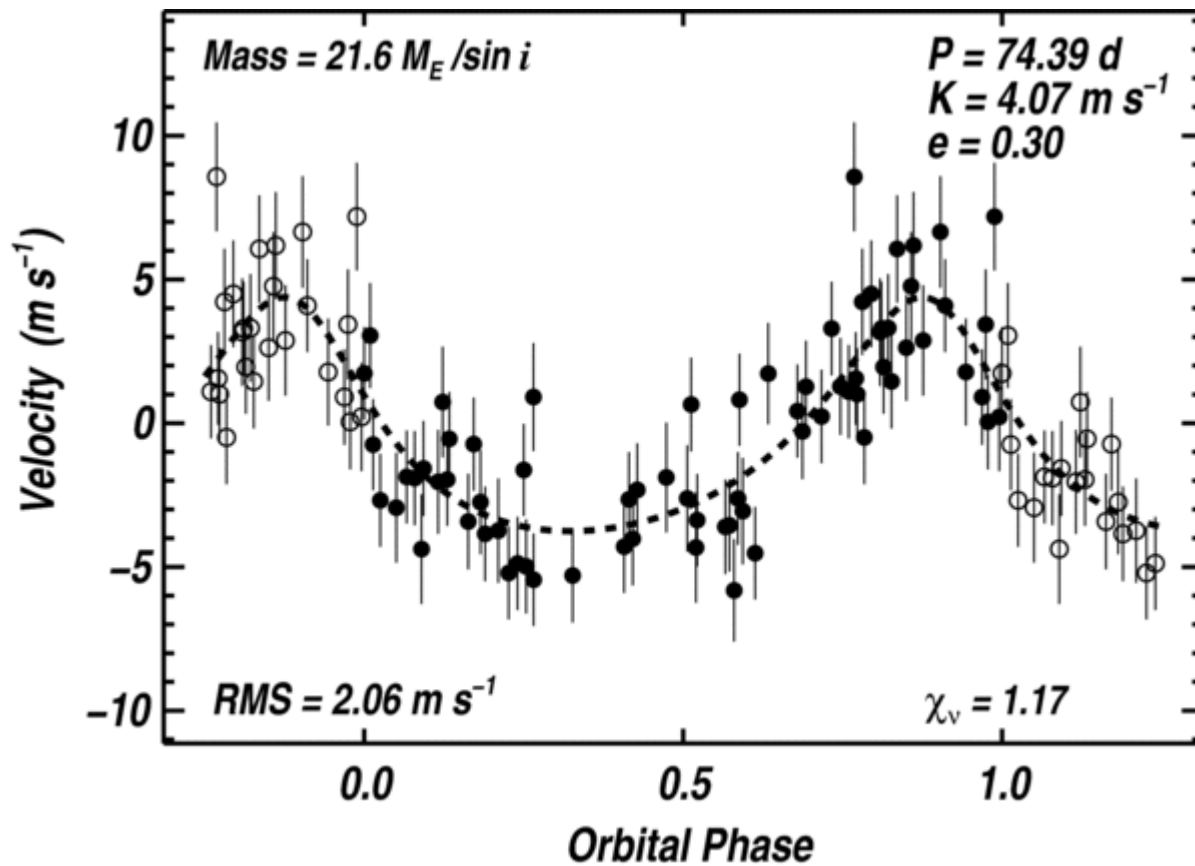
Stars

- Stellar atmospheres
 - Accurate chemical analysis
- Star formation
 - Evolution of circumstellar disks
- Stellar magnetic fields
 - Magnetic Doppler Imaging
- Stellar pulsations and stellar winds
 - The Sun at an “old age”

Exoplanets

- Discovery
- The Keck survey data re-processing
- Host star characterization
- Kepler follow-up

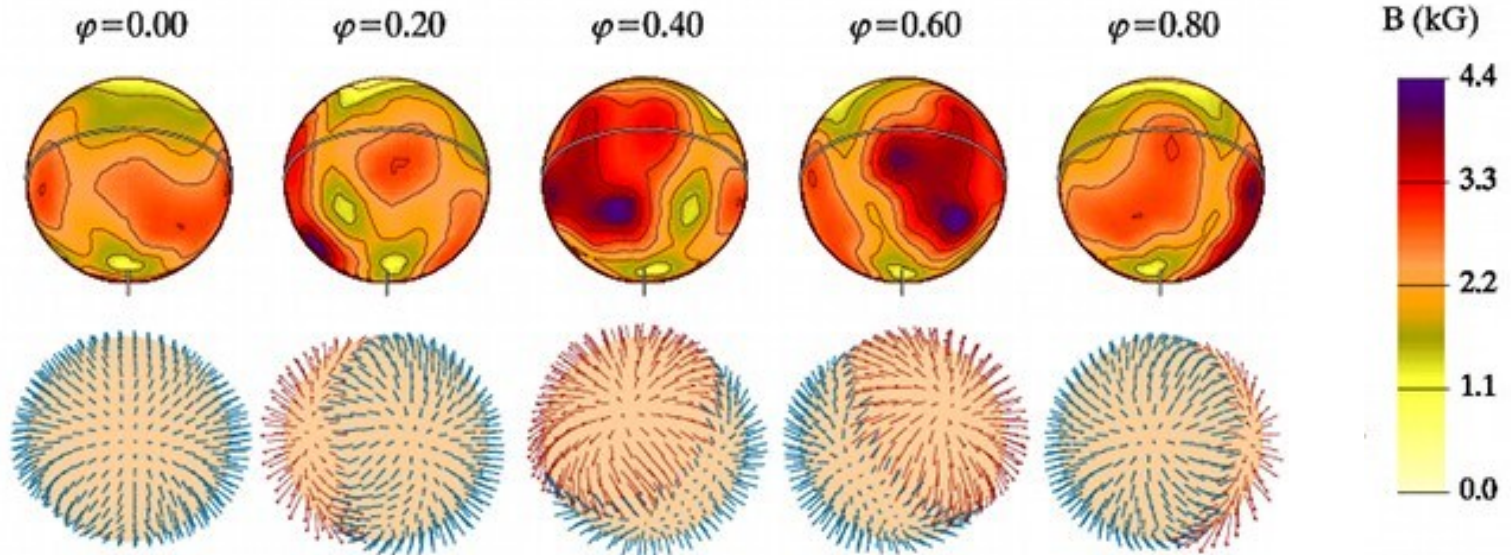
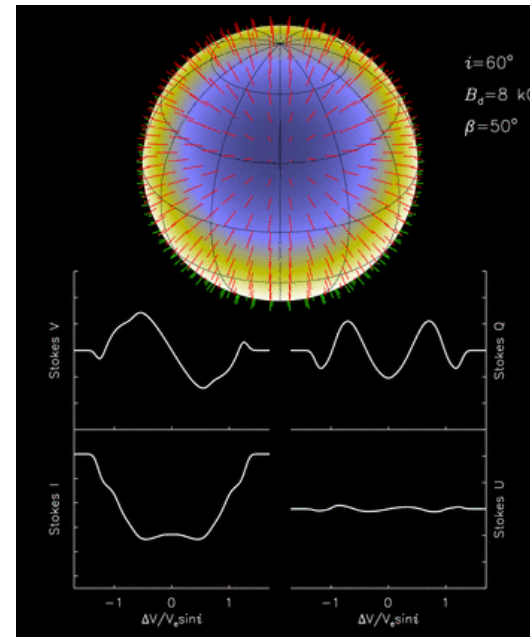
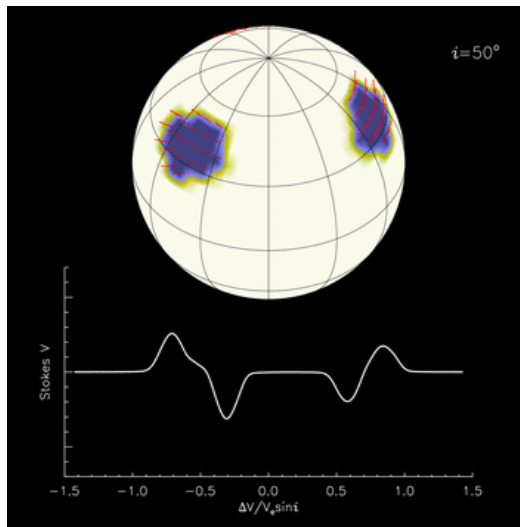
Kepler candidate study: Gl 785



Magnetic fields

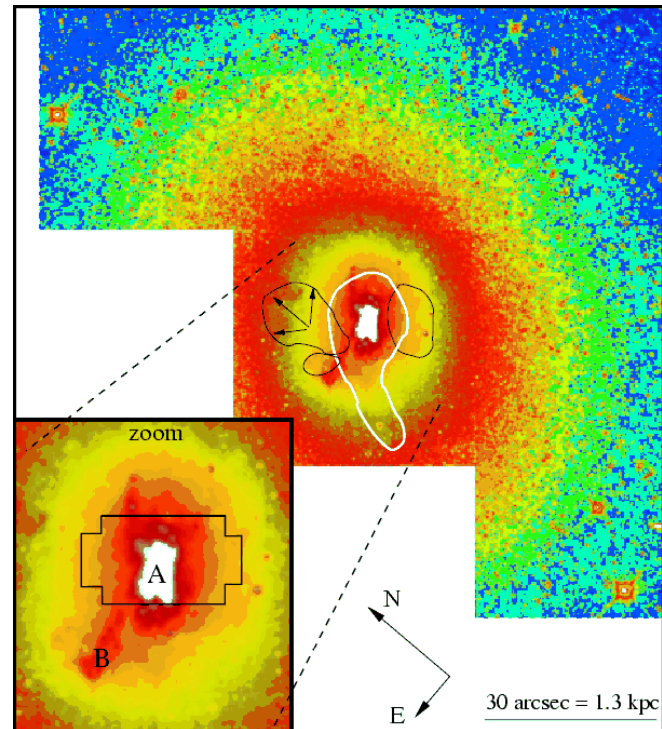
- Magnetic fields of Saturn
- Magnetic fields of the Sun
- Magnetic fields in stars of different mass and age
- Magnetic fields in proto-planetary disks

Stellar magnetic fields



Galaxies

- Chemical evolution and dynamics of the Milky Way (Gaia)
- Hierarchical assembly of galaxies

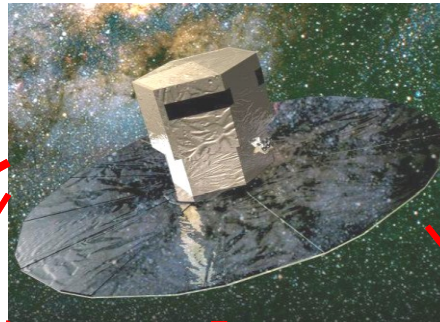
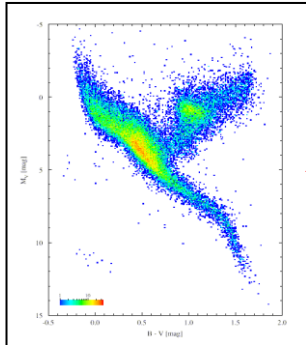


Methods and tools

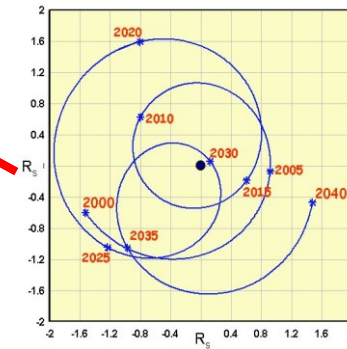
- Observations: UU is a top user of ESO telescopes
- Large surveys: Kepler, preparation for Gaia
- Active user of other telescopes: HST, NOT, CFHT, Keck, SSVT etc.
- Instrument development: HARPSpol
- Observation-based modelling: Doppler Imaging, solar inversion, proto-planetary disks
- Radiative energy transport and atomic and molecular data

Science with Gaia

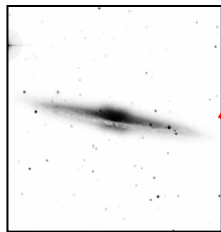
Stellar physics



Exo-planets

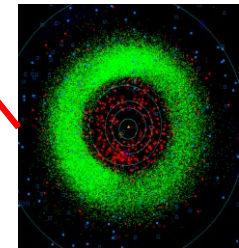
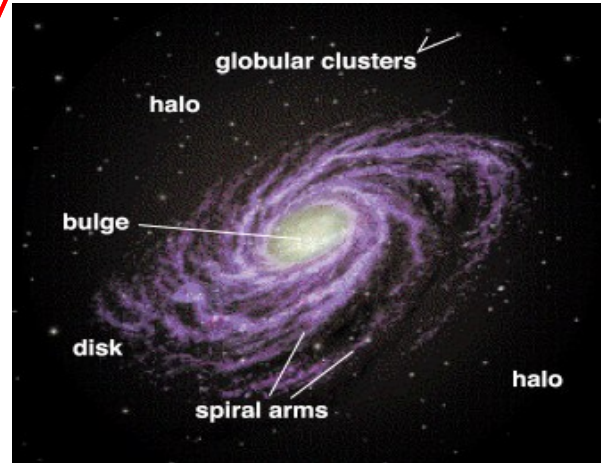


Galactic structure



Quasars
and
galaxies

Fundamental physics



Solar

system

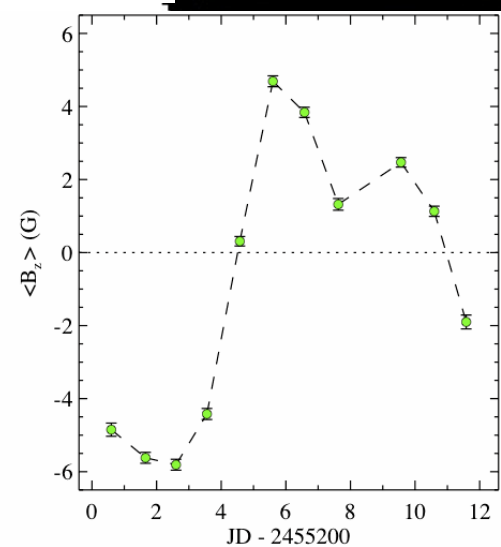
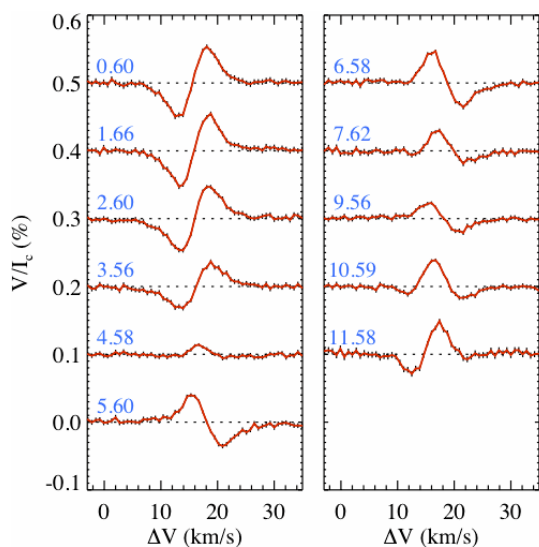
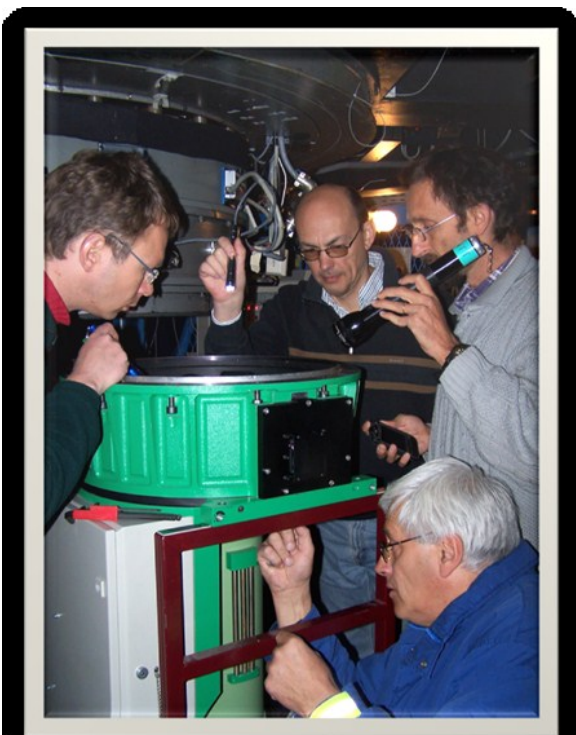
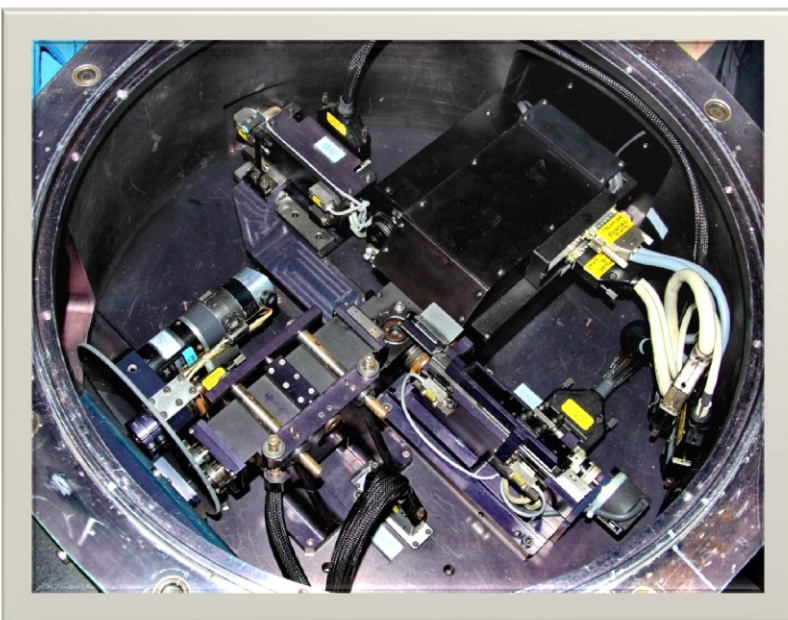
Stellar systems



gaia



HARPSpol



Relations with other astronomy programs

- Independent
- Complementary
- Intensive international collaborations
- Flexible and dynamic:
 - VALD/VAMDC (FP7, two programs)
 - HARPSpol (CAI)
 - Cassini (with IRFU)

Future goals and practical steps (1)

- Staying on the cutting edge of observations
- Focus on fewer but exciting problems:
 - Detection and characterization of exoplanets
 - The origins of stellar magnetic fields
 - History of the Solar system
 - History of the Milky Way
- Tighter collaboration with theoretical groups on planet formation (numerical simulations)

Future goals and practical steps (2)

- Large observing programs with existing telescopes:
 - Gaia-ESO survey – chemical analysis of Milky Way stars
 - MIMES – magnetic fields in massive stars
- Active participation in new telescopes and instruments:
 - Gaia space project (2013)
 - CRILES/VLT (2015, KAW application pending)
 - Rosetta/ESA (2015)
 - CODEX-SIMPLE/E-ELT (2017)
- Cross-departmental research:
 - Space and Planet Center (SPC)
 - VAMDC continuation project