WP1 : detecting low-mass planets

WP1.1 : Input catalog
- ✓ Determine the input catalog before the observation and optimize it during the survey to optimize planets detection
- ✓ list all relevant parameters (mass, age, temperature, rotation period, [Fe/H]…)
- ✓ conduct preparatory observations as needed

WP1.2 : Planets detection
- ✓ Organize / optimize SPIRou RV Survey to detect low-mass planets at short orbital periods (<150 d) (in particular in HZ)
- ✓ Organize / optimize SPIRou RV Survey to detect planets at larger period and multi-system
- ✓ Search for planets and determine orbital elements

WP1.3 : Detection limits and statistics
- ✓ Determine detection limits of RV survey
- ✓ Determine frequency occurrence of planets around M dwarfs
- ✓ Compare with theoretical model of planetary formation

WP1.4 : Photometric follow up of SPIRou Planets
- ✓ Organize photometric follow up by ground (ExTrA, …)
- ✓ Organize photometric follow up by space (CHEOPS, …)

WP2 : RV follow-up of transiting pl.

WP2.1 : target selection
- ✓ Establish criteria for target selection to optimize scientific return with SPIRou
- ✓ Collect data from :
  - ✓ **WP2.1.1** : TESS
  - ✓ **WP2.1.2** : K2
  - ✓ **WP2.1.3** : ExTrA
  - ✓ **WP2.1.4** : NGTS
- ✓ list all relevant parameters (mass, age, temperature, rotation period, [Fe/H]…)

WP2.2 : Planet characterization
- ✓ Organize / optimize SPIRou RV survey to confirm transiting planets and measure the planetary mass /Determine orbital parameters
- ✓ Identify planetary candidate and adapt strategy for planet mass characterization
- ✓ Search for another planets in the system
- ✓ Model fitting to analyse RV and photometric data
- ✓ Study exoplanet internal structures & compare w/ observations

WP2.3 : Complementary observations

- ✓ Organize complementary observation on sources detected (from WP1.2) or confirmed (from WP2.2) with SPIrou :
- ✓ SPIRou measurement of Rossiter
- ✓ SPIRou measurement of transmission and emission spectrum
- ✓ Organize complementary obs with JWST
- ✓ Organize complementary obs with ELT
- ✓ Organize complementary obs with CHEOPS
- ✓ .....
- ✓ Compare planetary spectrum with theoretical models of planet atmospheres

WP3 : Exploring stars and planets formation

WP3.1 : Input catalog
- ✓ Determine the input catalog before the observation and optimize it during the survey
- ✓ Select embedded class-I protostars, cTTS, wTTS
- ✓ list all relevant parameters (mass, age, temperature, veiling, accretion, rate, rotation period, …)
- ✓ conduct preparatory observations as needed

WP3.2 : Large-scale fields of low-mass protostars
- ✓ Organize / optimize SPIRou Zeeman Survey
- ✓ Monitor rotational modulation & reconstruct large scale magnetic field
- ✓ Study how magnetic topology & accretion patterns depend on stellar parameter
- ✓ compare w/ dynamo models of PMS stars

WP3.3 : Characterize inner accretion disc
- ✓ Organize complementary SPIRou observations
- ✓ Detect emission lines from innermost regions of accretion disc in class-I protostars & cTTSs
- ✓ characterize disc large-scale fields using zeeman signatures
- ✓ monitor best target
- ✓ reassess origin of disc field & impact on planet formation

WP3.4 : Search for hot Jupiter
- ✓ Search for hot jupiter in RV curves of wTTS
- ✓ Derive statistics (vu le nb de mesure nous sommes plus sur de la détection que de la stat)
- ✓ Compare to formation model

WP3.5 : Complementary observations & modeling
- ✓ organize complementaty observations : photometry, optical spectroscopy, X-rays (Chandra, XMM), radio (ALMA, NOEMA)
- ✓ Model corona winds & magnetospheric accretion
- ✓ Model properties of accretion funnels, shock & post-shock region, improve accretion model
- ✓ observe and model jets

WP4 : common studies of planetary system

WP4.1 : RV optimization
- ✓ Optimize RV extraction
- ✓ Telluric line subtraction linked to the Data processing center

WP4.2 : filtering activity
- ✓ filter activity jitter from RV curves
- ✓ Use simultaneous spectropolarimetry
- ✓ Look for correlations between spot distributions and large-scale magnetic topologies;

WP4.3 : Dynamics
- ✓ Study stability of multi-planets system
- ✓ Study evolution of the system
- ✓ Compare w/ observation

WP4.4 : Star-planet interaction
- ✓ Study tidal effect (synchronization, …)
- ✓ Study magnetic interaction

WP4.5 : Habitable zone
- ✓ Determine habitable zone for planetary system detected
- ✓ Model planetary climate

WP5 : Study common to all SPIRou Legacy Survey

WP5.1 : Spectral analysis

- ✓ Analyse SPIRou spectra
- ✓ Determine or Redetermine stellar parameters for all stars (Teff, logg, [Fe/H], activity, rotation)
- ✓ Locate them accurately in HR diagram

WP5.2 : Stellar magnetic properties of M-dwarfs
- ✓ Monitor rotational modulation & reconstruct large scale magnetic field
- ✓ Investigate how large-scale fields vary with stellar parameters among M dwarfs and low-mass protostars;
- ✓ compare w/ theoretical dynamo models of fully-convective and non-fully-convective stars;
- ✓ Investigate the link between magnetic properties and stellar activity

WP5.3 : Earth atmosphere
- ✓ Model telluric lines in reduced spectra and
- ✓ derive atmospheric properties (e.g., column densities of atmospheric molecules, wind speeds) and their evolution with time
- ✓ compare with similar data obtained at other sites (e.g., CSO, ESO).