Objectives of the meeting

- Define/confirm the various needs for limb darkening for PLATO
- Answering some questions

  - When are they needed : § prior to the launch (PLATO database) ?
    § during run of the pipeline in operation ?

  - What accuracy/precision is needed ?

  - What LD tables/formulation are available ?

  - Which one is the best for what purpose ?

  - What remains to be done in the years to come ?

Action : this will have to be documented in a technical note, first draft may 2019

- Define/confirm the various needs for limb darkening for PLATO
- What accuracy/precision is needed ?

→ **Exoplanets : fit of transits and Rp/R* ratios :**

Needed precision to get planet radius at 2% level : 0.3% , seems quite small !

Action : to be justified/checked/ confirmed.

Who ? How ?

Can this be achieved ?

→ **Interferometric stellar radii**

Needed precision : 2%

Can be achieved for bright stars. For PLATO, P2 sample

Action : - sensitivity to LD choice in the visible ?

-cross-match the spectral type/magnitude/precision on angular Diameter table with the expected list of stars in sample 2. Use of the PLATO inp catalogue

- Define/confirm the various needs for limb darkening for PLATO
- What accuracy/precision is needed ?

→ **Stellar activity-spot modelling** → ← Intensity profile- LD coef.- interfer. radii

- Would require a whole workshop
- conclusions from the PLATO exoplanet meeting 1 last november ?

- When are they needed : § prior to the launch (PLATO database) ?
  § during run of the pipeline in operation ?
- What LD tables/formulation are available ?

→ **Fix or fit ?**

prior to the launch (PLATO database)

during run of the pipeline in operation

1) Fix the LD law and fit the coefficients using 3D simulation : power2-qpower2 -

→ prior to the launch (PLATO database)

tools are ready for exoplanets (CHEOPS, bright stars)

Validated with eclipsing binaries

Direct use or can serve as prior

Action : application to interferometric radii ?
Application to 'faint' stars (mag 8-9) ?

- When are they needed : § prior to the launch (PLATO database) ?
  § during run of the pipeline in operation ?
- What LD tables/formulation are available ?

2) Fix the LD law and fit the coefficients for each star

→ during run of the pipeline in operation

Fast but problems of degeneracy

Issue : Still worth to do it ?

- When are they needed : § prior to the launch (PLATO database) ?
  § during run of the pipeline in operation ?
- What LD tables/formulation are available ?

3) Fit the intensity profile from model atmosphere for each star

→ during run of the pipeline in operation

- 1D models : fast - large extended grids available ?
  radiative transfer more sophisticated than in 3D models

Issue/Action : - is it accurate enough to get Rp at 2%
- what if non local prescription for convection?
- can serve as prior ?

- 3D models : require validation by comparison with observations (Sun) and other benchmark stars but then

Issue/action - B comes into play
- opacity improvement ?
- increase accuracy due to opacity group and can the process be speed up ?

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Which one is the best for what purpose ?

- If fit to model atmopshere for each star is the option, compromise :
  1.5D model atmospheres : (3D thermal gradient in 1D model atmosphere ?)
  is the optimized solution for PLATO pipeline?

• **Other issue concerning limb darkening for transit and Rp/R* measurement**

What part of these issues is our stellar business ?
What part   is the exoplanet colleagues' business ?

• **Other issue concenring the interferometric radius**

--Assuming Teff from spectroscopy
Teff from interferometry
are available :
If they disagree (at 3 sigma level ?), just give a flag ?
If they agree within error bars, which one should be used as the PLATO value ?

--Same for Radius from interferometry
Radius from seismology

If they disagree (at 3 sigma level ?), just give a flag ?
If they agree within error bars, which one should be used as the PLATO value ?

Other issue : consistency between the physical descriptions in model atmospheres and stellar interiors

Important at the level of PLATO requested precisions