Splinter on winds/environment

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Impact of winds on exoplanets

• Star/planet formation
  – Strong star-planet interaction
  – Not targets for SPICA
• Main sequence
  – M dwarfs: strong magnetic interaction, needs complementary observations like SPIROU, magnetic field measurements
  – Otherwise no significant impact of winds on the MS
• Later evolution
  – There is impact from winds (red giants, evolved stars, massive evolved stars), but these are not (prime) exoplanet targets
Impact of winds on asteroseismology targets

• Wind/mass loss has an impact on red giants
  – Red giants might not be main targets for PLATO, only as complementary science
  – For red giants, CHARA-SPICA can get estimates of flux fractions of the CSE and geometric sizes of envelopes
• Sub-giants: mass loss more negligible than for red giants
• More massive stars, B, Be, B[e] stars
  – not core targets, but winds would have an impact.
  – With SPICA, need to model an additional geometrical component
  – SPICA can be complementary to asteroseismology missions for hotter stars
Impact of winds on SBCRs

- SBCRs explore
  - Dwarfs, subgiant, giants
  - Different metallicities
  - B, mostly FK, stars some M dwarfs
  - Target list will already be ‘cleaned’
- For hotter stars we have to take environments into account (for creating and using them)
- M dwarfs have winds, which need to be taken into account (for creating and using them)
- Impact on infrared photometry, reddening (for creation)
- For K giants there is impact from mass loss, which creates reddening
Selection of 200 bright stars

• AGB/RSG stars
  – mV<5 excludes many red dust-enshrouded stars
  – Explore possibility to include AGB/Miras/RSG/post-RSG (around maximum light)
  – Define upper limit on the angular diameter, so that they are not over-resolved
  – get complementary short-baseline data (e.g. SPHERE, or speckle imaging)
  – Observe few stars in details (incl. shocks in Halpha) with time-series (AI: need to find targets)
  – There are ongoing projects to observe large samples of AGB stars, need to explore the sample

• Winds in K giants / first giant branch stars:
  – Better targets for CHARA/SPICA in terms of angular size
  – Do statistics for a large number of stars on CSE flux fraction, dust shell sizes

• O stars: no targets

• B, Be, B[e] stars:
  – Certainly interesting targets for CHARA/SPICA
  – Velocity measurements with MR spectral resolution
  – Not much expertise in our splinter meeting

• Variable stars (Cepheids, del Sct, RR Lyrae)
  – find/characterize envelopes
  – Are CSEs common for these targets?
Complementary ways/observations

• Combine uv-plane filling with 8m-class AO instruments (e.g. SPHERE)
• Spectro-polarimetric measurements
  – pMS, M dwarfs: Magnetic fields
  – Evolved stars: Linear polarization
• Models
  – Cool stars: need to include more physical processes (magnetic fields, radiative pressure on lines in addition to convection), constrain new models
  – Hot star wind models
• Evolved stars: Combine SED, spectroscopy, interferometric imaging at several wavelength, CO observations, etc.
• VLTI-MATISSE observations of dust: difficult to find common targets?
• B, Be, B[e]:
  – Radio observations (free-free emission)
  – Near/mid-IR imaging observations
Strategies

• Time series for variable stars
• Some stars observable only at maximum light?
• Spectral resolution
  – AGB/RSG stars would need higher spectral resolution to measure velocity fields, but those stars are mostly too resolved for CHARA-SPICA
  – B/Be/B[e] stars: Resolution of 3000 is sufficient to study velocity fields
• To do: get (K magnitude and) angular diameters of all stars brighter than mV=4…5 and observable by CHARA; define upper limit on the angular diameter to not over-resolve the stars