

Exam Homework

Quantitative spectroscopy of massive hot stars

Selected chapters on astrophysics

November-December 2022

1. Retrieve an optical spectrum of an O-type star from SOPHIE/ELODIE archive of high-resolution stellar spectra (or any other archive you are familiar with), normalize the spectrum, and correct it by Doppler shift to ensure that all diagnostic lines are located at the laboratory position. What is the speed of the star relative to the Earth? Is it moving towards us or away from us?
 2. **This task is optional (i.e., not obligatory).** Try to find a PoWR model which fits the observed spectrum of your chosen star the best. Which corrections have to be applied to the PoWR model (i.e., the synthetic spectrum) in order to achieve better fit to the observations?
 3. Which lines in the optical region can be used for T_{eff} determination for stars with $T_{\text{eff}} < 27$ kK? Which lines in the IR region can be used for T_{eff} determination for stars with $T_{\text{eff}} > 30$ kK? Plot figures which show how these lines change with T_{eff} using the PoWR models of Galactic OB type stars.
 4. Try to find out what is the terminal wind velocity of the PoWR model with $T_{\text{eff}} = 40$ kK and $\log g = 4.2$ (the model marked as 40-42) of Galactic OB type stars. Discuss which lines can be used for the v_{∞} determination and elaborate how the value of the v_{∞} can be obtained from the spectrum.
- PoWR models for Galactic OB type stars: <https://www.astro.physik.uni-potsdam.de/~PoWR/>.
 - SOPHIE/ELODIE on-line database: <http://atlas.obs-hp.fr/elodie/>.
 - For any further question you can contact lecturer Brankica Kubátová by email brankica.kubatova@asu.cas.cz.