

F8601 – Modelling of stellar atmospheres

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- ***Basic general equations of stellar atmospheres***
- ***Grey atmosphere:*** Hopf function, two-step grey atmosphere, backwarming, mean opacities (flux mean opacity, Rosseland mean opacity)
- ***Static LTE model atmospheres:*** hydrostatic equilibrium, energy equilibrium (radiative equilibrium, convection), Unsöld-Lucy temperature correction method, convective instability criteria, modelling of convection
- ***Static NLTE model atmospheres:*** overview of equations, discretization of equations and their solution, complete linearization method, application of the accelerated lambda iteration method, spherically symmetric model atmospheres, NLTE heating
- ***Opacity in model atmospheres:*** absorption, emission and scattering, line blanketing and its treatment in LTE and NLTE
- ***Analysis of stellar spectra:*** curves of growth, spectral classification, application of model atmospheres in analysis of stellar spectra, radiative diffusion, stellar rotation, one-dimensional models of circumstellar disks
- ***Stellar wind:*** types of stellar winds, isothermal stellar wind and its solution, effect of additional forces in stellar winds, coronal wind, dust driven wind
- ***Line radiatively driven wind:*** mechanism of wind acceleration and momentum transfer, radiative acceleration, its determination and limiting cases, CAK solution and its properties, determination of terminal wind velocities and mass-loss rates, stability of stellar wind, inhomogeneous stellar wind
- ***Multidimensional model atmospheres***

Basic recommended literature

- Kubát, J., 2021, *Základy fyziky hvězdných atmosfér*, učební text v IS
- Hubeny, I., Mihalas, D., 2014, *Theory of Stellar Atmospheres*, Princeton University Press
- Mihalas, D., 1978, *Stellar Atmospheres*, 2nd ed., W. H. Freeman & Comp., San Francisco
- Lamers, H. J. G. L. M., Cassinelli, J. P., 1999, *Introduction to Stellar Winds*, Cambridge Univ. Press

Supplementary literature

- Gray, R. F., 2005, *The Observation and Analysis of Stellar Photospheres*, 3rd ed., Cambridge University Press
- Monier R., Smalley B., Wahlgren G., Stee Ph. (eds.), 2010, *Non-LTE Line Formation for Trace Elements in Stellar Atmospheres*, EAS Publ. Ser. Vol. 43
- Niemczura, E., Smalley, B., Pych, W. (eds.), 2014, *Determination of Atmospheric Parameters of B-, A-, F- and G-Type Stars*, Springer Verlag Berlin