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INTERPRETING SPECTROPOLARIMETRIC RESULTS ACROSS A BROAD SPECTRAL RANGE - 3D RADIATIVE TRANSFER WITH THE STOKES CODE

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While constantly being underestimated, spectropolarimetric data often contains independent information about astrophysical objects and thereby complements spectroscopy or imaging techniques. A given polarization state can be due to a specific emission mechanism, reprocessing events, magnetic fields, or even relativistic effects in the source. The polarization behavior across emission and absorption lines can be particularly insightful due to the drastic but systematic change of opacity across a narrow spectral range and possible resonant line scattering. To interpret spectropolarimetric data, detailed radiative transfer modeling is necessary. In this lecture I point out some important polarization results that were obtained in various areas of astrophysics and that illustrate how to exploit different polarization mechanisms. Then, I describe the radiative transfer code STOKES that is being developed at Strasbourg University. The code enables spectral and polarization modeling across a broad spectral range reaching from the optical to the X-ray band. Due to its Monte-Carlo approach, STOKES enables 3D radiative transfer and takes into account variability effects. While it was designed for research on active galactic nuclei, the code is rather versatile and can be applied to other astrophysical areas. I am going to show a few examples of STOKES modeling of intensity and polarization spectra as well as polarization images. A basic version of the code is publicly available at http://www.stokes-program.info/ and will be upgraded shortly.