

# 第 58 回 RESCEU コロキウム



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日 時: 2023 年 10 月 12 日(木) 13:00 ~14:00

場 所: 理学部 1 号館 207 室・Zoom (ハイブリッド)

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## Time-Evolving Photoionisation in the XRISM era

### Abstract

Photoionisation is one of the main mechanisms shaping the gaseous environment of bright astrophysical sources, including Active Galactic Nuclei (AGNs), Gamma-Ray Bursts (GRBs) and compact sources. Much information on the gas physics, chemistry and kinematics, as well as on the ionising source itself, can be gathered through optical to X-ray spectroscopy. Just to name a few examples, mildly relativistic, photoionised outflows from AGNs transfer a significant amount of the accretion-liberated energy to the host galaxy scale, possibly driving its evolution. In X-Ray Binaries, gas feeding is regulated through massive winds outflowing from the accretion disc. In GRBs, spectroscopy of the ionised circumburst gas gives unique insights on the progenitor star and on the ISM, even at cosmological distances. Finally, the evolution of the gas reservoir at galactic and cluster scales is regulated by its radiative and collisional heating and cooling balance.

For all these cases, several public time equilibrium photoionisation codes are available to analyse the spectroscopic imprint of the gas in the observations. However, as most (if not all) the sources discussed above are intrinsically variable, such codes are only able to offer an average description of the gas properties and, in the most extreme cases, can lead to an erroneous diagnostic of its density, physics and geometry. In all these cases, time-evolving photoionisation is necessary to properly analyse the observations and derive the gas properties consistently, and thus its impact on the environment.

In this talk I will present our new Time-Evolving Photoionisation Device (TEPID; Luminari+23), a new code that self-consistently solves the time evolving photoionisation equations and accurately follows the response of the gas to changes of the ionising source. TEPID produces time-resolved gas absorption spectra that can be directly fitted to optical to X-ray observations. Time evolving ionisation offers a unique channel to directly constrain the gas number density, which is a totally degenerate quantity at equilibrium, and thus is necessary to properly estimate the gas mass load and the energy budget. Such time-evolving codes are especially needed in light of the recently-launched XRISM satellite, whose microcalorimeter Resolve will perform unprecedented high-resolution spectroscopy through the entire X-ray band and will make equilibrium codes obsolete.

Finally, I will present two applications of TEPID to dramatically different environments - AGN ionised absorbers and the circumburst environments of GRBs - to offer a glimpse of the unique capabilities offered by time-evolving photoionisation.

興味をお持ちの方の聴講を歓迎致します。