SYNERGY OF THE VIRTUAL OBSERVATORY IN THE CONTEXT OF THE ASTROPHYSICAL LABORATORY WORK

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ABSTRACT

The Virtual Observatory (VO) is an ambitious project promoted by the astronomical community in the 21st century. It aims to allow global electronic access to the available astronomical data archives in an era when astronomers have been experiencing an avalanche of data produced by the increase of the number and the quality of the instruments. his initiative is indispensable for the whole astronomical community: observational, theoretical, computational and experimental. In this contribution we try to analyse the synergies between spectroscopic data provided by VO and the laboratory work developed at the Experimental Astrophysics Laboratory group of Alcoi.

Key words: Methods: laboratory; Virtual Observatory.

1. VIRTUAL OBSERVATORY

The final objective of the VO is doing real science. It is expected that archives and data centres can be accessed through the International VO linking the computer users to the available astronomical data of space and ground-based observatories, sky survey data bases, etc. using an appropriated protocol. With this procedure astronomers will be able to do their research by using the VO capabilities: multi-wavelength, multi-epoch, sky observational data, simulated data, catalogues etc.

This new framework gives astronomical researches new perspectives, because (Sang Chul et al, 2005):

1) it offers the opportunity to do real multi-wavelength studies of objects.

2) it offers unbiased, homogeneous and best quality data.

3) it offers the possibility of discovering new objects or substances.

Similarly to how a real observatory consists of telescopes, each one with different astronomical instruments, the VO consists of a collection of data centres, software systems and processing capabilities, which will enable new science.

2. EXPERIMENTAL ASTROPHYSICS LABORATORY GROUP OF ALCOI

We have studied ices of astrophysical interest, determining the density and the real part of the index of refraction of simple molecules and mixtures for the UV-Vis wavelengths. Sublimation temperatures of pure ices (water, carbon monoxide, methane, nitrogen and carbon dioxide) and their binary mixtures with carbon dioxide have been determined. The next research line at the Experimental Astrophysics Laboratory group of Alcoi is the spectroscopic characterisation of ices deposited as thin films in Far Infrared (FIR) for applications to Interstellar Medium (ISM). In addition we want to determine the effect of UV irradiation. The importance of this study is paramount, because it does not exist any systematic study of pure ice nor of mixtures in the FIR (although some groups have carried out isolated experiments up to 100 microns). These wavelengths are studied nowadays by satellites (AKARI, SPITZER, up to 200 microns) and in addition to that this range will be extended by HERSCHEL until submillimetric lengths (670 microns). So, the science generated by these satellites could take better profit if laboratory data in this wavelength range are available, because they are practically nonexistent at the moment.

The experiments are performed in a vacuum chamber operating at 10^{-7} mbar obtained by a turbo-molecular pump in a High Vacuum System backed by a root pump (Satorre M.A., In press). With a cryostat we cool down the sample at 10 K. A resistor and temperature controllers let us to increase the temperature until 300 K. When initial conditions are established, the gases (pure or mixture) prepared in a pre-chamber passes trough a needle valve to the chamber. The proportions of a particular mix-

ture are controlled by their partial pressures. Our sample holder (placed vertically) is a quartz crystal that makes up our own Quartz Crystal Microbalance whose frequency is measured precisely by a frequencymeter. The deposited samples can be chemically processed by UV photons to form new molecules which composition is monitored by mass spectroscopy and whose thickness and refraction index are measured by mean double laser technique (Luna R. et al, 2002).

3. USING THE SYNERGIES BETWEEN VO AND LABORATORY WORK

1) VO offers a great opportunity to the astronomic community to increase their resources in order to perform their researches.

2) From the spectroscopy laboratory work, VO is a good source to obtain observational spectra in order to plan experiments at the laboratory.

3) Taking advantage of the capacities of VO will increase the possibility of discovering new substances and understanding the physical processes that have produced the observed lines.

4) To incorporate the laboratory work in the VO would be beneficial also for this virtual platform because it would extend its field of interest to the astronomical community.

5) Therefore, it is important to promote the synergies between the VO and the experimental astrophysics laboratories and plan future collaborations.

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