Exoplanets atmospheres in a test tube

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The ancient philosophers' dream of thousands of new world finally came true: more than 1900 extrasolar planets have been discovered in the neighborhood of our Sun. Most of them are very different from those we used to know in our Solar System. Some of them orbit their parent star inside the belt known as Habitable Zone (HZ), where a rocky planet with the right climate could allow the presence of liquid water on its surface. Those planets, in HZ or not, will be the object of observation that will be performed by new instruments, both space- and ground-based.
Exoplanets are unique objects in astronomy because they have local counterparts —the Solar System planets— available for comparative planetology studies, but there also are interesting outsider cases like Super Earths. In our own system, proto-planets evolution was flanked by an active prebiotic chemistry that brought the rise of life on Earth. The first step in the search for life signatures requires the knowledge of planet atmospheres, which is the main goal of future exoplanetary space explorations. Indeed, the quest for the determination of the chemical composition of extrasolar planets' atmospheres is of much larger value than what suggested by the specific case. It leads to the more general speculation on what such detection might tell us about the presence of life on those planets. As, for now, we have only one example of life in the universe, and we are bound to study terrestrial organisms to assess possibilities of life on other planets, to guide our search for possible extinct or existent life on other planetary bodies. The planet atmosphere characteristics and possible biosignatures will be inferred by studying its composite spectrum, in order to identify the emission/ absorption lines/bands from atmospheric molecules such as water (H_2O), carbon monoxide (CO), methane (CH_4), ammonia (NH_3), *etc*. In particular, it is important to know in detail the optical characteristics of gases in the typical physical conditions of the planetary atmospheres, and how those characteristics could be affected by radiation-driven photochemical and biochemical reaction. Insights in this direction can be achieved from laboratory studies of simulated planetary atmosphere of different pressure and temperature conditions, under the effects of radiation sources, used as proxies of different bands of stellar emission. A number of Italian research Institutes -University, INAF, INFN and CNR- started a collaboration in order to share their experience in performing laboratory experiments on several living organisms, concerning extrasolar planet Atmospheres. In this talk we describe the scientific case, the net of institutions and their main activities that go under the name of "Atmosphere in a Test Tube".