Space lab to elucidate how liquid cocktails mix

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What does space experimentation have in common with liquid cocktails? Both help in understanding what happens when multiple fluids are mixed together and subjected to temperature change - a phenomenon ubiquitous in nature and industrial applications such as oil fluids contained in natural reservoirs. The latest experimental data performed in zero gravity on the International Space Station is now available in the newly published Topical Issue of *EPJ E*. The results constitute the first set of highly accurate and broadly validated data on the thermodiffusion effects that occur when three different liquids are mixed. Such experiments were made possible by a collaboration of space agencies including the ESA, NASA, CSA and ROSCOSMOS.

The problem under scrutiny is scientifically much more complex than it may appear. The thermodiffusion mechanism - also called the Soret effect - is the product of an imposed temperature difference and leads to concentration differences within a mixture. The trouble is that it is that because it is a weak effect, it is still poorly understood, 150 years after its discovery.

Until now studies have focused on mixes of two liquids. But the liquids found in nature, as well as in cocktails and in industrial applications usually contain more than just two components. This has produced a shift in research to multicomponent systems.

New measurements in this series of studies stem from six different teams, which were then compared and averaged out. The teams

performed parallel measurements of the Soret coefficient of the same mixtures containing three different liquids. To counter difficulties in measurement due to thermal instabilities and changes in solubility, the teams performed experiments in space, where gravitational effects are dramatically reduced. They then repeated them on the ground. The result: a benchmark of the Soret effect in ternary liquid mixtures, which will guide future theoretical and numerical models.

More information: Benchmark values for the Soret, thermodiffusion and molecular diffusion coefficients of the ternary mixture tetraline+isobutylbenzene+n-dodecane with 0.8-0.1-0.1 mass fraction. M. M. Bou-Ali, A. Ahadi, D. Alonso de Mezquia, Q. Galand, M. Gebhardt, O. Khlybov, W. Köhler, M. Larrañaga, J. C. Legros, T. Lyubimova, A. Mialdun, I. Ryzhkov, M. Z. Saghir, V. Shevtsova, S. Van Varenbergh (2015), *Eur. Phys. J. E* 38: 30, DOI: 10.1140/epje/i2015-15030-7

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