A brown dwarf joins the jet-set

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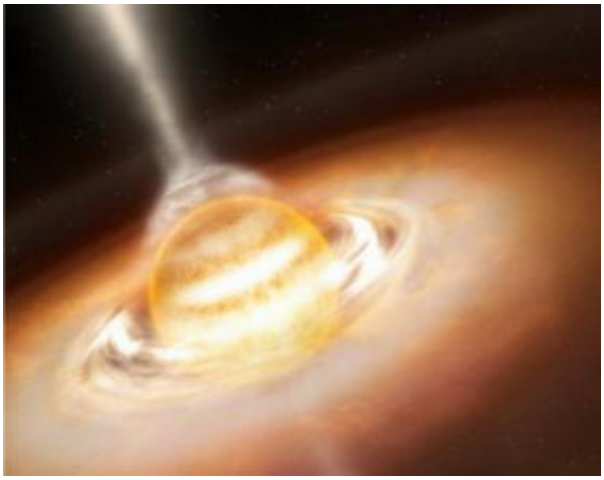

Using ESO&acutes VLT, astronomers found jets coming out from a 24 Jupiter-mass brown dwarf, showing that outflows are rather ubiquituous in the Universe and leading to the prospect that that young giant planets could also be associated with outflows. (c) ESO

Jets of matter have been discovered around a very low mass 'failed star', mimicking a process seen in young stars. This suggests that these 'brown dwarfs' form in a similar manner to normal stars but also that outflows are driven out by objects as massive as hundreds of millions of solar masses down to Jupiter-sized objects.

Brown dwarfs are objects whose masses are below those of normal stars - the borderline is believed to be about 8% of the mass of our Sun - but larger than those of planets. Unlike normal stars, brown dwarfs are unable to sustain stable nuclear fusion of hydrogen.

The brown dwarf with the name 2MASS1207-3932 is full of surprises. Its companion, a 5 Jupiter-mass giant, was the first confirmed exoplanet for which astronomers could obtain an image, thereby opening a new field of research - the direct detection of alien worlds. It was then later found that the brown dwarf has a disc surrounding it, not unlike very young stars.

Now, astronomers using ESO's Very Large Telescope (VLT) have found that the young brown dwarf is also spewing jets, a behaviour again quite similar to young stars.

The mass of the brown dwarf is only 24 Jupiter-masses. Hence, it is by far the smallest object known to drive an outflow. "This leads us to the tantalizing prospect that young giant planets could also be associated with outflows," says Emma Whelan, the lead-author of the paper reporting the results.

The outflows were discovered using an amazing technique known as spectro-astrometry, based on high resolution spectra taken with UVES on the VLT. Such a technique was required due to the difficulty of the task. While in normal young stars - known as T-Tauri stars for the prototype of their class - the jets are large and bright enough to be seen directly, this is not the case around brown dwarfs: the length scale of the jets, recovered with spectro-astrometry is only about 0.1 arcsecond long, that is, the size of a two Euro coin seen from 40 km away.

The jets stretch about 1 billion kilometres and the material is rushing away from the brown dwarf with a speed of a few kilometres per second.

The astronomers had to rely on the power of the VLT because the observed emission is extremely faint and only UVES on the VLT could provide both the sensitivity and the spectral resolution they required.

"Discoveries like these are purely reliant on excellent telescopes and instruments, such as the VLT," says Whelan. "Our result also highlights the incredible level of quality which is available today to astronomers: the first telescopes built by Galileo were used to observe the moons of Jupiter. Today, the largest ground-based telescopes can be used to observe a Jupiter size object at a distance of 200 light-years and find it has outflows!"

Using the same technique and the same telescope, the team had previously discovered outflows in another young brown dwarf. The new discovery sets a record for the lowest mass object in which jets are seen.

Outflows are ubiquitous in the Universe, as they are observed rushing away from the active nuclei of galaxies - AGNs - but also emerging from young stars. The present observations show they even arise in still lower mass objects. The outflow mechanism is thus very robust over an enormous range of masses, from several tens of millions of solar mass (for AGNs) down to a few tens of Jupiter masses (for brown dwarfs).

Source: European Southern Observatory