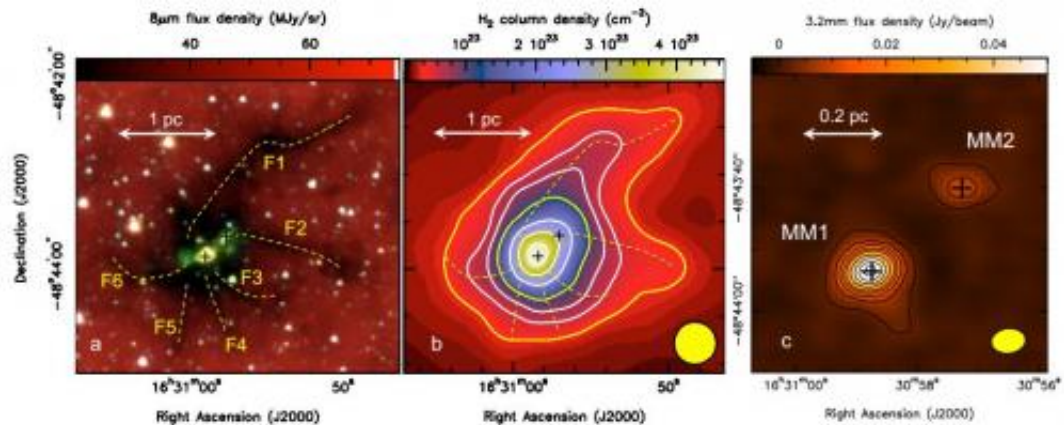


# Astronomers witness birth of Milky Way's most massive star

July 10 2013



a) Mid-infrared Spitzer composite image. b) Herschel column density image of SDC335. c) ALMA 3.2 mm dust continuum emission of the central region of SDC335 where two cores are identified, MM1 and MM2. Credit: *A&A* 555, A112 (2013)

(Phys.org) —Scientists have observed in unprecedented detail the birth of a massive star within a dark cloud core about 10,000 light years from Earth.

The team used the new ALMA (Atacama Large Millimetre/submillimetre Array) telescope in Chile – the most powerful radio telescope in the world – to view the stellar womb which, at 500 times the mass of the Sun and many times more luminous, is the largest ever seen in our galaxy.

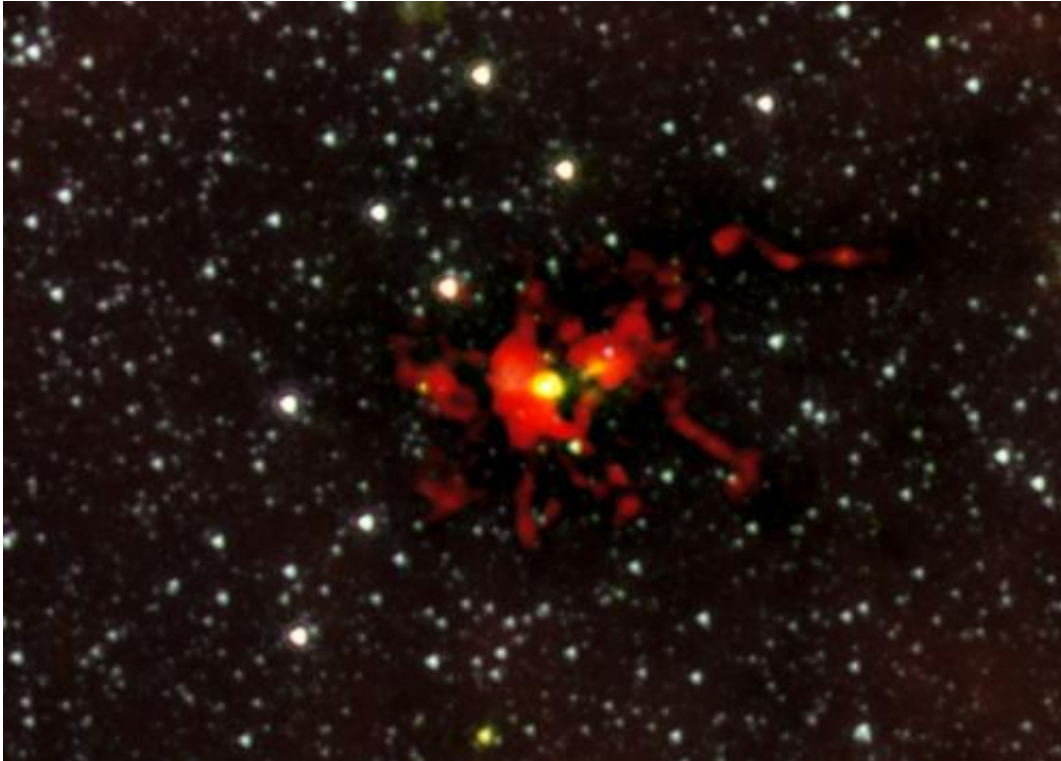
The researchers say their observations – to be published in the journal *Astronomy and Astrophysics* – reveal how matter is being dragged into the centre of the huge gaseous cloud by the [gravitational pull](#) of the forming star – or [stars](#) – along a number of dense threads or [filaments](#).

"The remarkable observations from ALMA allowed us to get the first really in-depth look at what was going on within this cloud," said lead author Dr Nicolas Peretto, from Cardiff University. "We wanted to see how monster stars form and grow, and we certainly achieved our aim. One of the sources we have found is an absolute giant—the largest protostellar core ever spotted in the Milky Way!

"Even though we already believed that the region was a good candidate for being a massive star-forming cloud, we were not expecting to find such a massive embryonic star at its centre. This cloud is expected to form at least one star 100 times more massive than the Sun and up to a million times brighter. Only about one in 10,000 of all the stars in the Milky Way reach that kind of mass."

Different theories exist as to how these massive stars form but the team's findings lend weight to the idea that the entire cloud core begins to collapse inwards, with material raining in towards the centre to form one or more massive stars.

Co-author Professor Gary Fuller, from The University of Manchester, said: "Not only are these stars rare, but their births are extremely rapid and childhood short, so finding such a massive object so early in its evolution in our Galaxy is a spectacular result.



Observations of the dark cloud SDC 335.579-0.292 using the Atacama Large Millimeter/submillimeter array (ALMA) have given astronomers the best view yet of a monster star in the process of forming. A stellar womb with over 500 times the mass than the Sun has been found and appears as the yellow blob near the centre of this picture. This is the largest ever seen in the Milky Way -- and it is still growing. The embryonic star within is hungrily feeding on the material that is racing inwards. It is expected to give birth to a very brilliant star with up to 100 times the mass of the Sun. This image combines data from ALMA and NASA's Spitzer Space Telescope. Credit: ALMA (ESO/NRAJ/NRAO)/NASA

"Our observations reveal in superb detail the filamentary network of dust and gas flowing into the central compact region of the cloud and strongly support the theory of global collapse for the formation of [massive stars](#)."

The University of Manchester hosts the Science and Technology Facilities Council (STFC)-funded support centre for UK astronomers

using ALMA, where the observations were processed.

Team member Dr Ana Duarte-Cabral, from the Université de Bordeaux, said: "Matter is drawn into the centre of the cloud from all directions but the filaments are the regions around the star that contain the densest gas and dust and so these distinct patterns are generated."

Dr Peretto added: "We managed to get these very detailed observations using only a fraction of ALMA's ultimate potential. ALMA will definitely revolutionise our knowledge of star formation, solving some current problems, and certainly raising new ones."

**More information:** 'Global collapse of molecular clouds as a formation mechanism for the most massive stars,' *Astronomy & Astrophysics*, [www.aanda.org/articles/aa/pdf/ ... 13/07/aa21318-13.pdf](http://www.aanda.org/articles/aa/pdf/.../13/07/aa21318-13.pdf)

Provided by University of Manchester

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