Astrophysics Report

NAOMI MCCLURE-GRIFFITHS

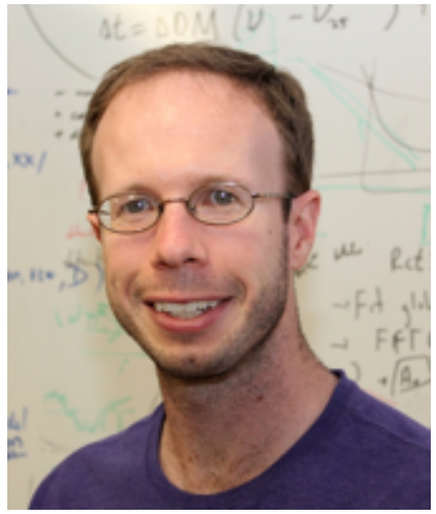
DEPUTY HEAD OF ASTROPHYSICS

5 DECEMBER 2013

People

New Starters:

- Ian Heywood - Senior research scientist
- Paolo Serra - OCE SL research scientist
- Megan Johnson - OCE SL Postdoc
- Laura Gomez - Australis Fellow
- Matthew Kerr - OCE postdoc



Departures:

- Jimi Green ⇒ SKA Office
- Ilana Feain ⇒ USyd Medical Physics (as of March 2014)
- Eli Bressert ⇒ Data science industry

Meetings since June

ATCA 25th Science Symposium
3-6 Sept 2013

Phase Transitions in the Diffuse ISM
25-27 Nov 2013

RFI and its impact on HI Workshop
17-18 June 2013

Upcoming Meetings

Upcoming Meetings

Southern Cross VII:

"Powerful AGN and their Host Galaxies Across Cosmic Time"

16-20 June 2014 Port Douglas, Queensland

telescope

Background Image: astrometry.fas.

A Population of Fast Radio Bursts at Cosmological Distances

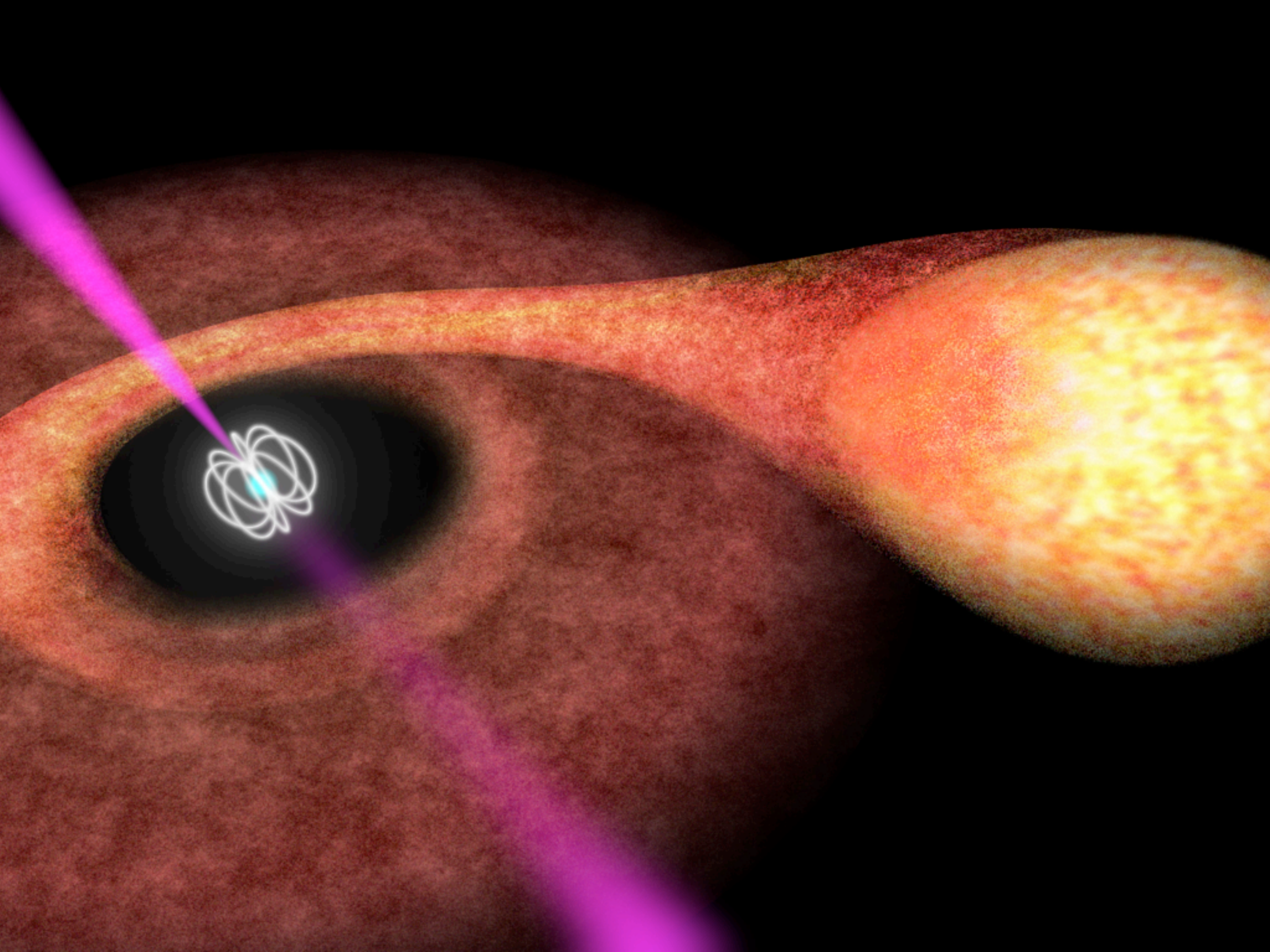
Science, 5 July 2013

D. Thornton,[1,2*] B. Stappers,[1] M. Bailes,[3,4] B. Barsdell,[3,4] S. Bates,[5] N. D. R. Bhat,[3,4,6] M. Burgay,[7] S. Burke-Spolaor,[8] D. J. Champion,[9] P. Coster,[2,3] N. D'Amico,[10,7] A. Jameson,[3,4] S. Johnston,[2] M. Keith,[2] M. Kramer,[9,1] L. Levin,[5] S. Milia,[7] C. Ng,[9] A. Possenti,[7] W. van Straten[3,4]

Searches for transient astrophysical sources often reveal unexpected classes of objects that are useful physical laboratories. In a recent survey for pulsars and fast transients, we have uncovered four millisecond-duration radio transients all more than 40° from the Galactic plane. The bursts' properties indicate that they are of celestial rather than terrestrial origin. Host galaxy and intergalactic medium models suggest that they have cosmological redshifts of 0.5 to 1 and distances of up to 3 gigaparsecs. No temporally coincident x- or gamma-ray signature was identified in association with the bursts. Characterization of the source population and identification of host galaxies offers an opportunity to determine the baryonic content of the universe.

telescope

Background Image: astrometry.fas.



Swings between rotation and accretion power in a binary millisecond pulsar

A. Papitto, C. Ferrigno, E. Bozzo, N. Rea, L. Pavan, L. Burderi, M. Burgay, S. Campana, T. Di Salvo, M. Falanga, M. D. Filipović, P. C. C. Freire, J. W. T. Hessels, A. Possenti, S. M. Ransom, A. Riggio, P. Romano, J. M. Sarkissian, I. H. Stairs, L. Stella, D. F. Torres, M. H. Wieringa & G. F. Wong

Affiliations | Contributions | Corresponding author

Nature **501**, 517–520 (26 September 2013) | doi:10.1038/nature12470

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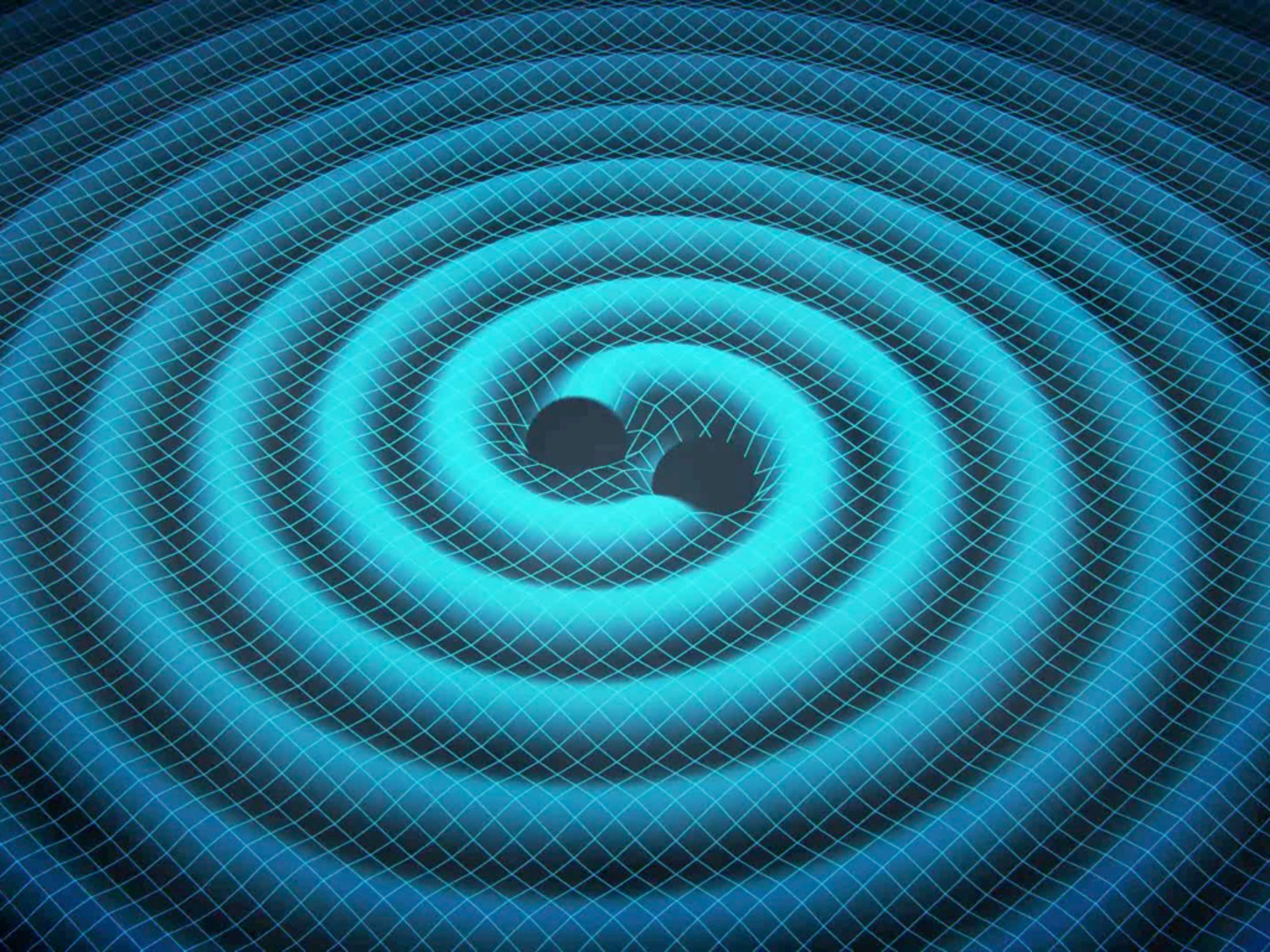
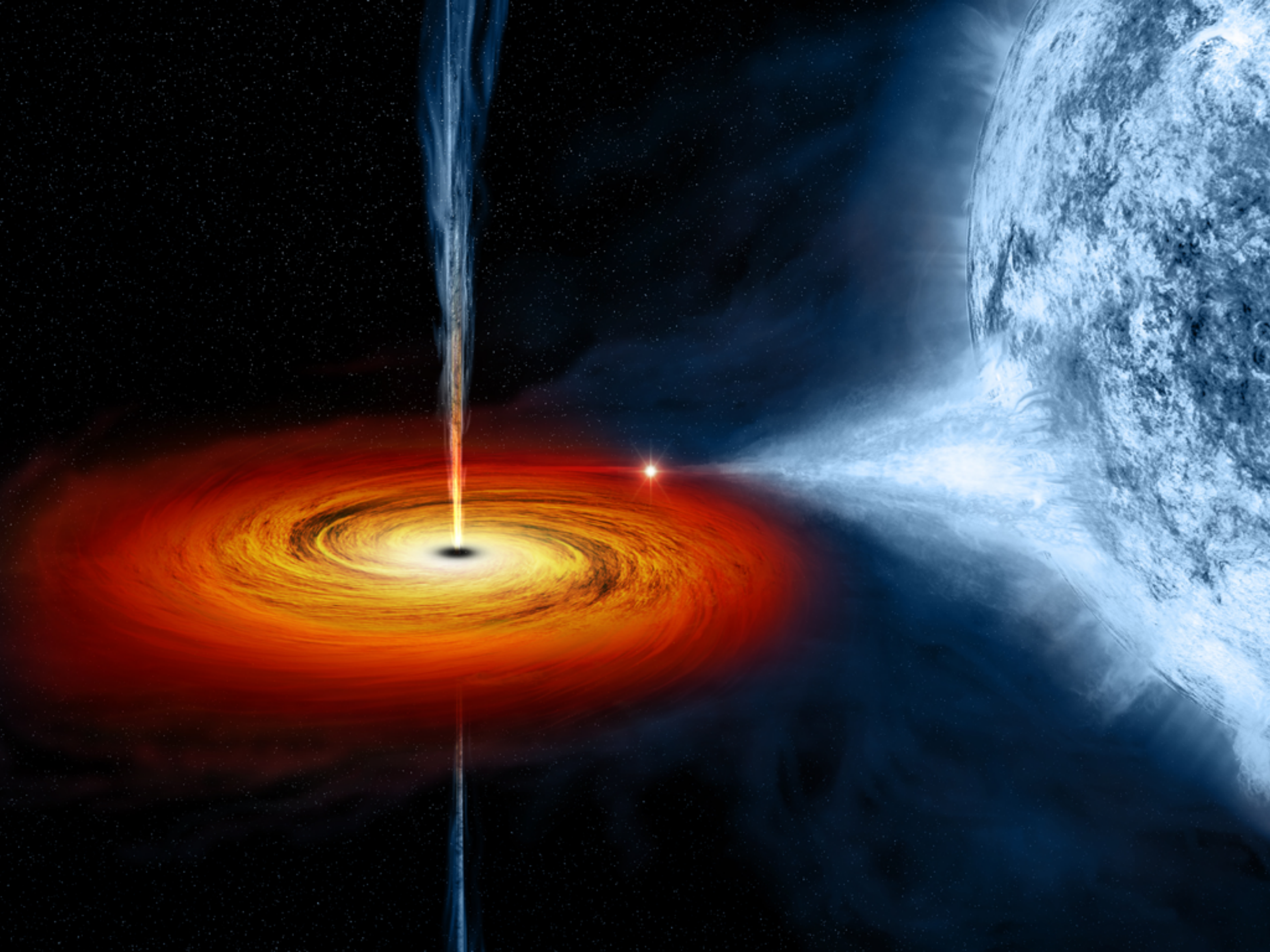


Gravitational-Wave Limits from Pulsar Timing Constrain Supermassive Black Hole Evolution

Science October 18 2013

R. M. Shannon,[1*†] V. Ravi,[1,2*†] W. A. Coles,[3] G. Hobbs,[1] M. J. Keith,[1] R. N. Manchester,[1] J. S. B. Wyithe,[2] M. Bailes,[4] N. D. R. Bhat,[4,5] S. Burke-Spolaor,[6] J. Khoo,[1,7] Y. Levin,[8] S. Osłowski,[4] J. M. Sarkissian,[9] W. van Straten,[4] J. P. W. Verbiest,[10] J.-B. Wang[1,11]

The formation and growth processes of supermassive black holes (SMBHs) are not well constrained. SMBH population models, however, provide specific predictions for the properties of the gravitational-wave background (GWB) from binary SMBHs in merging galaxies throughout the universe. Using observations from the Parkes Pulsar Timing Array, we constrain the fractional GWB energy density (Ω_{GW}) with 95% confidence to be $\Omega_{GW}(H_0/73 \text{ kilometers per second per megaparsec})^2 < 1.3 \times 10^{-9}$ (where H_0 is the Hubble constant) at a frequency of 2.8 nanohertz, which is approximately a factor of 6 more stringent than previous limits. We compare our limit to models of the SMBH population and find inconsistencies at confidence levels between 46 and 91%. For example, the standard galaxy formation model implemented in the Millennium Simulation Project is inconsistent with our limit with 50% probability.



Baryons in the relativistic jets of the stellar-mass black-hole candidate 4U 1630-47

María Díaz Trigo, James C. A. Miller-Jones, Simone Migliari, Jess W. Broderick & Tasso Tzioumis

Affiliations | Contributions | Corresponding author

Nature (2013) | doi:10.1038/nature12672

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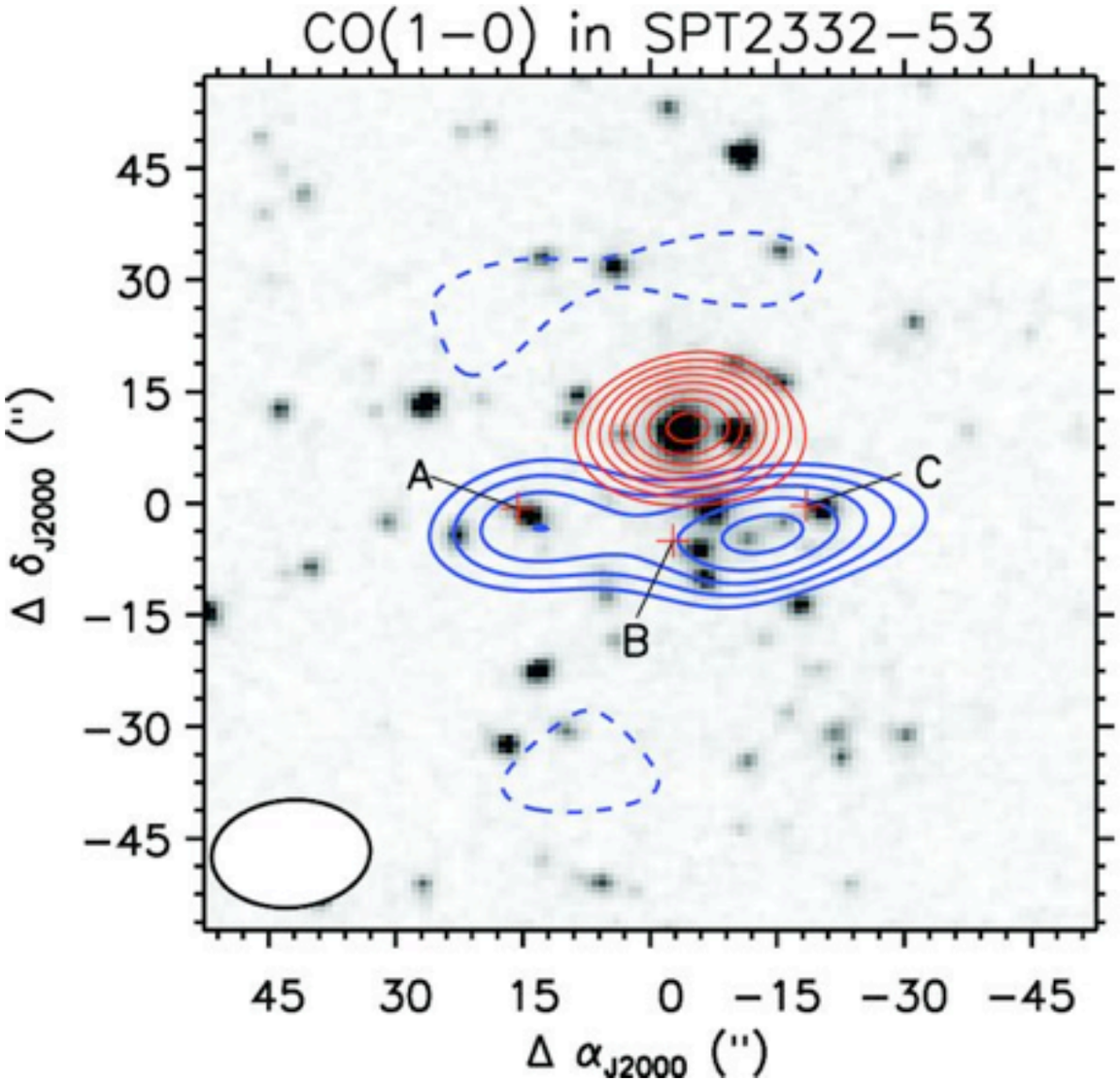
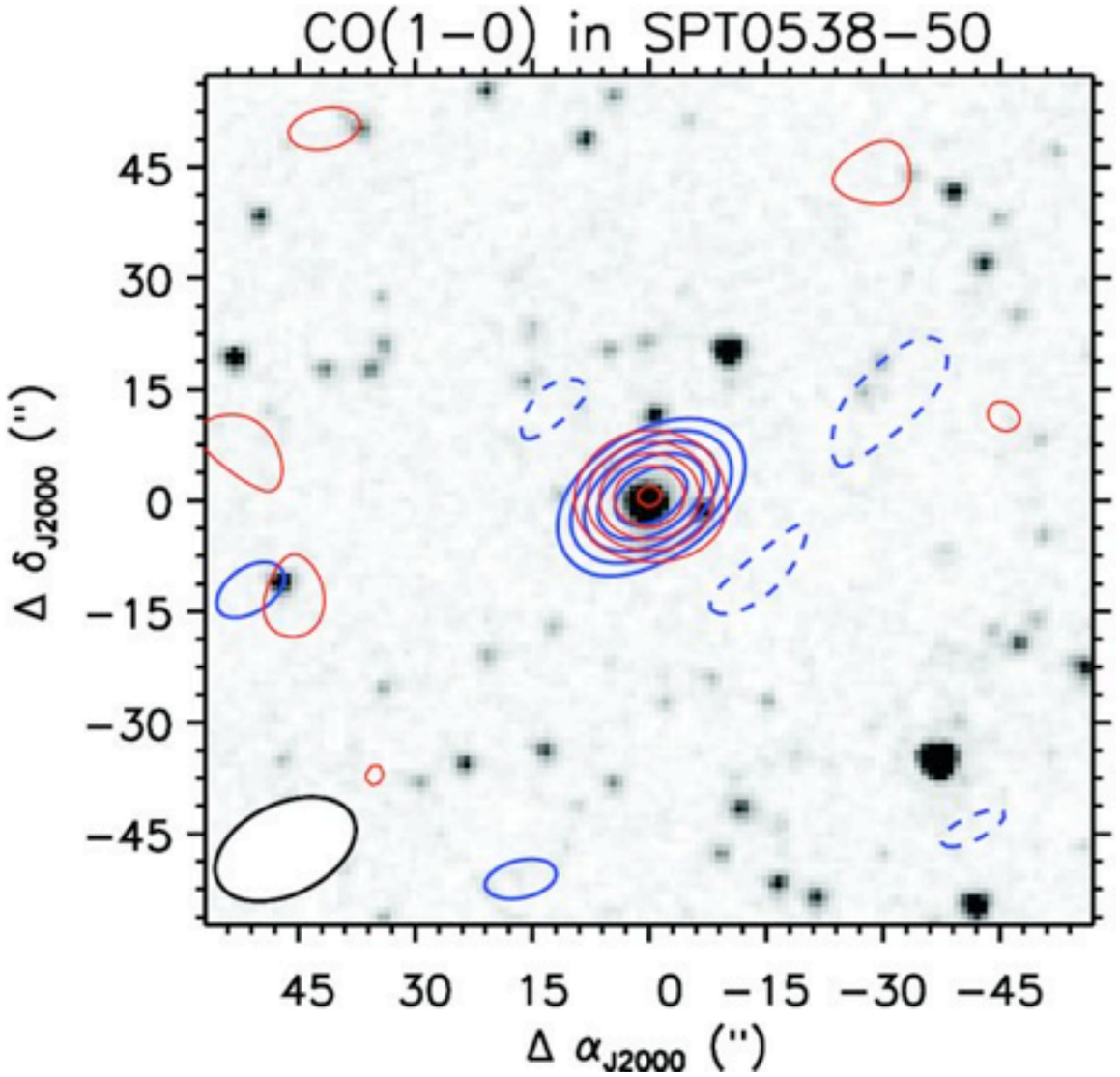
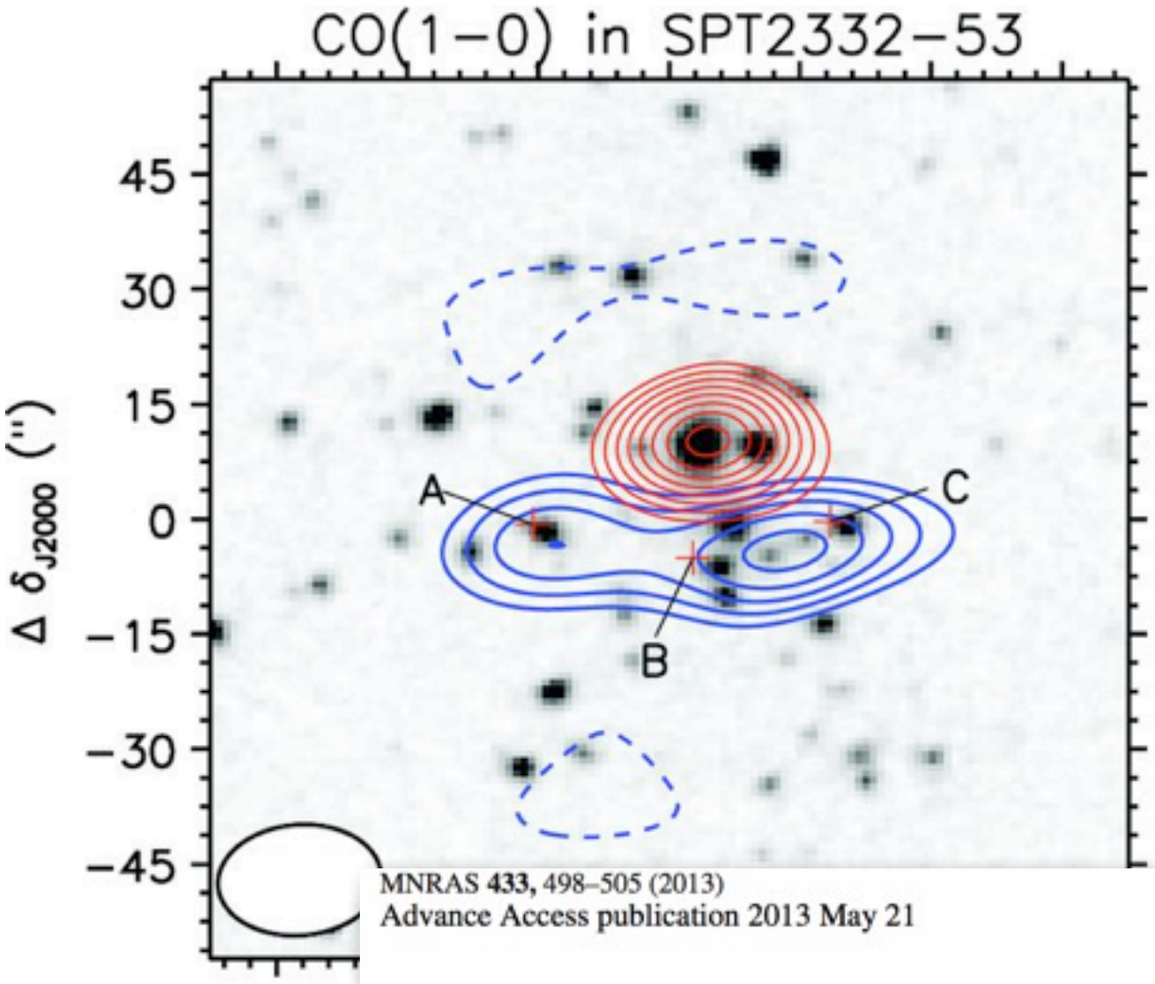
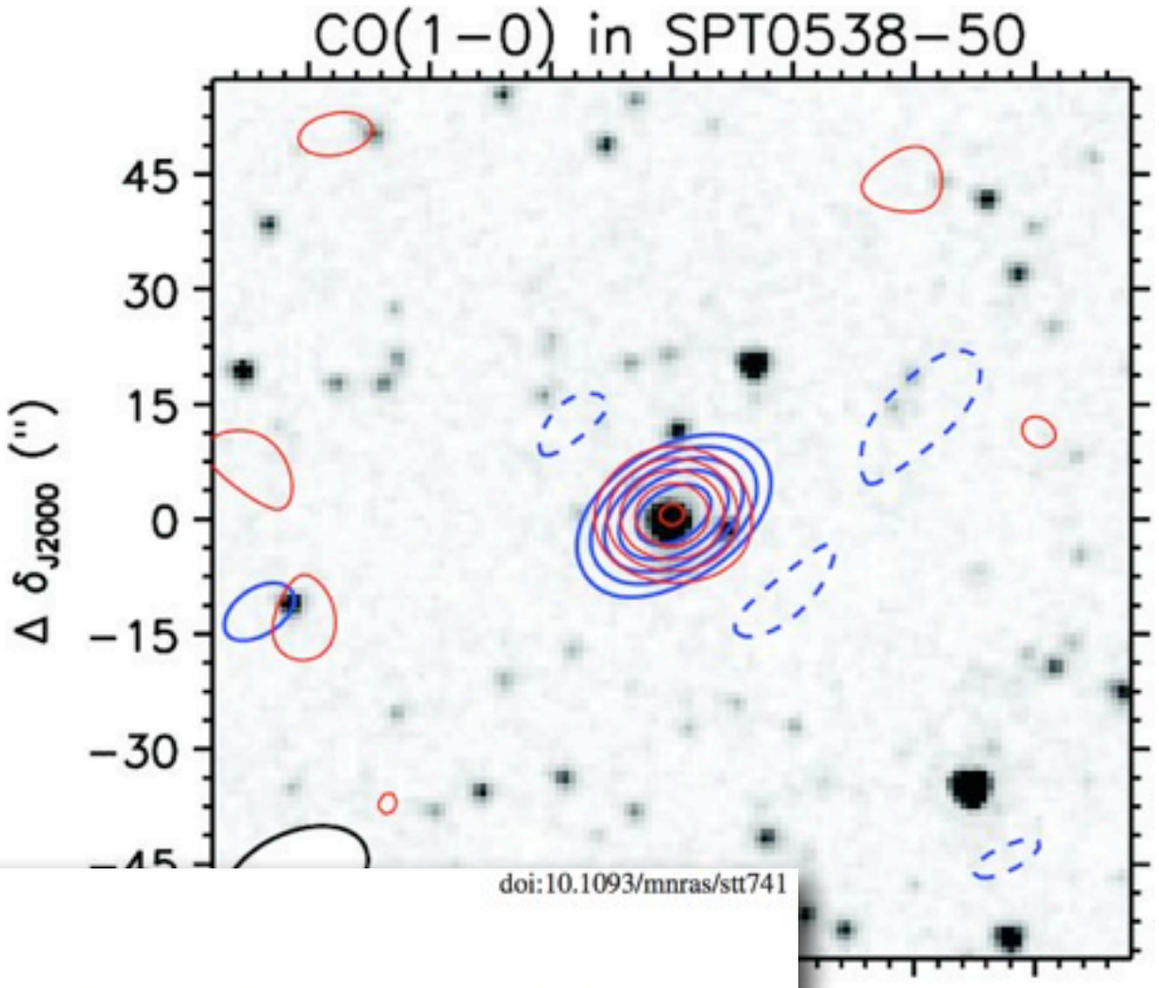

CO(1−0) in SPT2332−53
A
B
C
45
30
15
0
−15
−30
−45
Δ δJ2000 (")
Δ αJ2000 (")


CO(1−0) in SPT0538−50
45
30
15
0
−15
−30
−45
Δ δJ2000 (")
Δ αJ2000 (")





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Large gas reservoirs and free–free emission in two lensed star-forming galaxies at $z = 2.7$

M. Aravena,[1⋆] E. J. Murphy,[2] J. E. Aguirre,[3] M. L. N. Ashby,[4] B. A. Benson,[5,6] M. Bothwell,[7,8] M. Brodwin,[9] J. E. Carlstrom,[5,6,10,11,12] S. C. Chapman,[13,14] T. M. Crawford,[5,11] C. de Breuck,[1] C. D. Fassnacht,[15] A. H. Gonzalez,[16] T. R. Greve,[17] B. Gullberg,[1] Y. Hezaveh,[18] G. P. Holder,[18] W. L. Holzapfel,[19] R. Keisler,[5,10] M. Malkan,[20] D. P. Marrone,[7] V. McIntyre,[21] C. L. Reichardt,[19] K. Sharon,[5,11] J. S. Spilker,[7] B. Stalder,[4,22] A. A. Stark,[4] J. D. Vieira[23] and A. Weiß[24]

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