Dimensions of Discovery

Technology in learning and research

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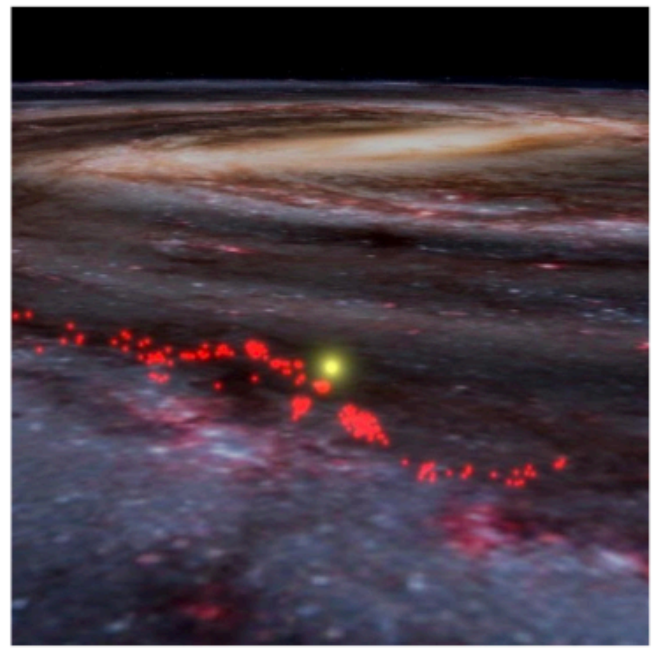
tinyurl.com/dimensionsofdiscovery

DIMENSIONS OF DISCOVERY

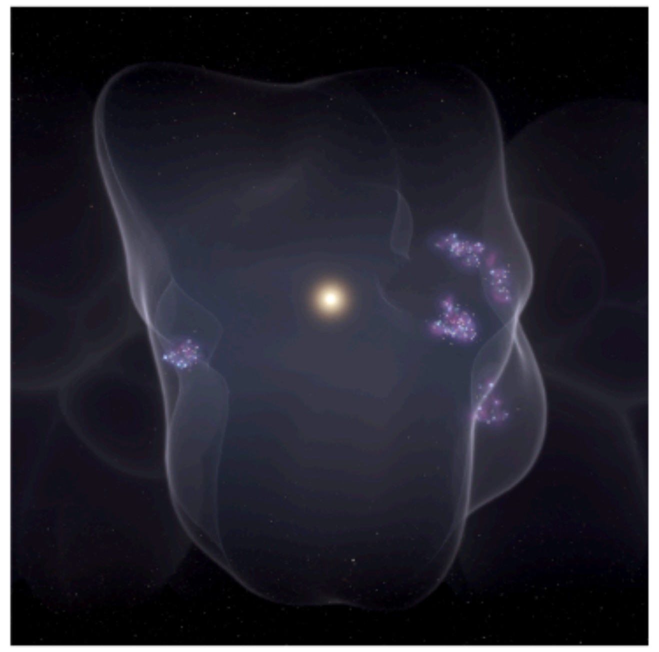
A web page created by Alyssa Goodman to showcase the use of technology in research, education, and communication, of science and more.

What's happening "these days?" A sampler of ongoing and recent projects.



The Radcliffe Wave

A gigantic "wave" of dense gas that forms the spine of the Local Arm of the Milky Way. (Alves et al. 2020, *Nature*)



The Local Bubble

A 1000-light-year-wide bubble surrounding the Sun and Earth is apparently responsible for the formation of all nearby, young stars. (Zucker et al. 2022, *Nature*)

PredictionX

The best place to learn more about the past, present, and future of the future. Through dynamic online learning, PredictionX uncovers the role of uncertainty in the world around us.

Data + Climate

A collaboration of researchers at Harvard and Google, making data discoverable and available to researchers seeking to uncover novel solutions to climate and su

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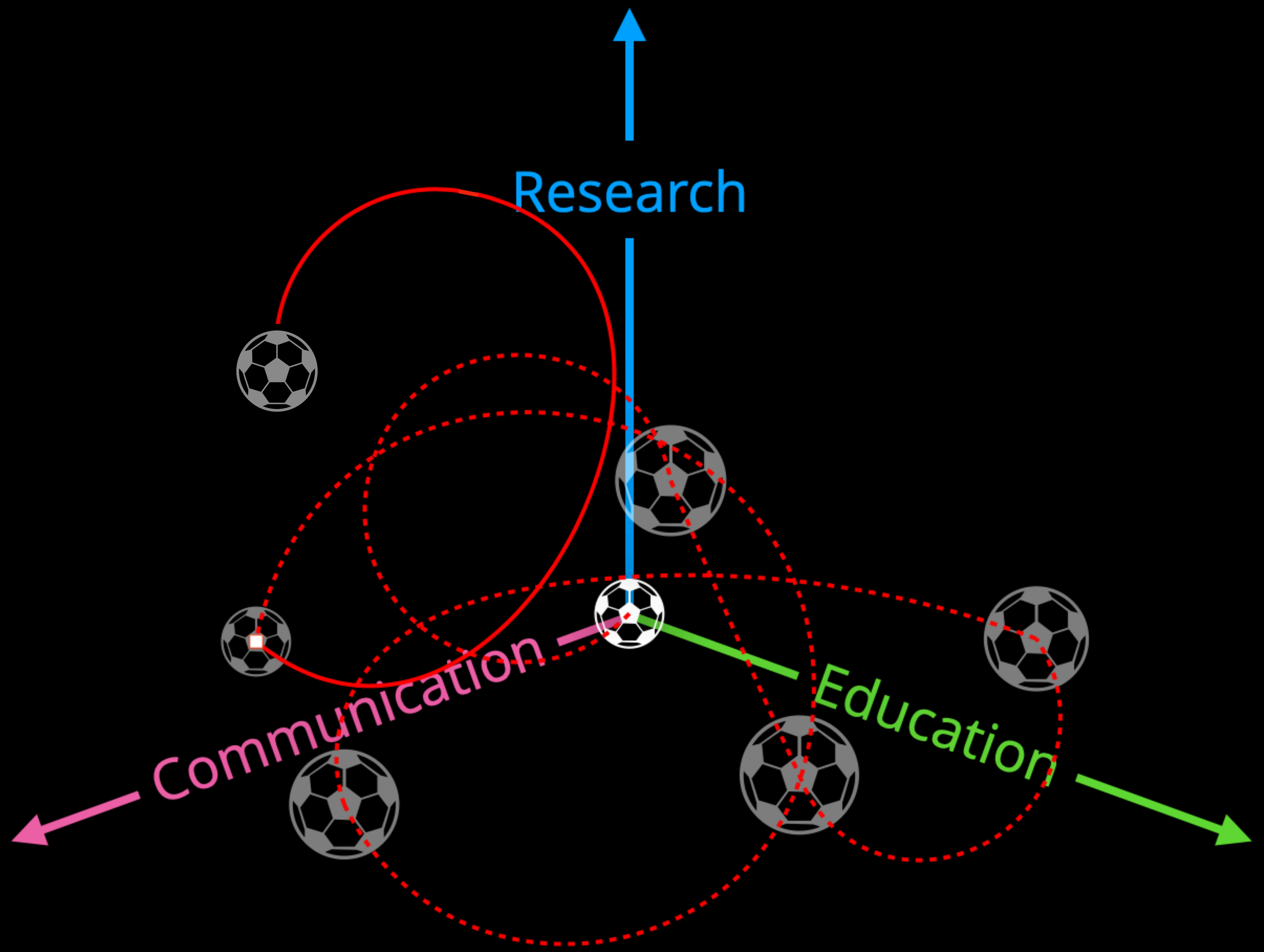
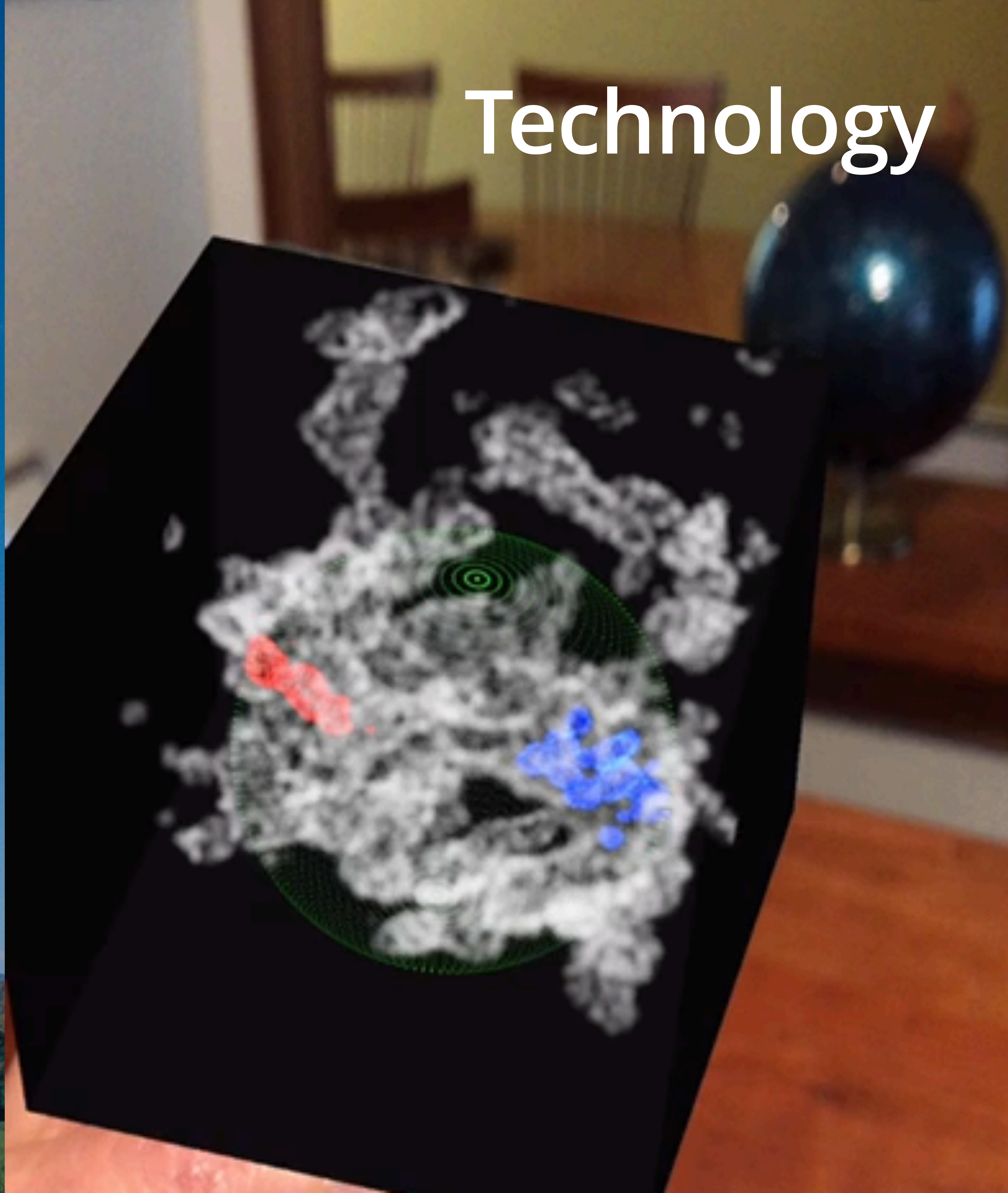
When to use what technology?

Science

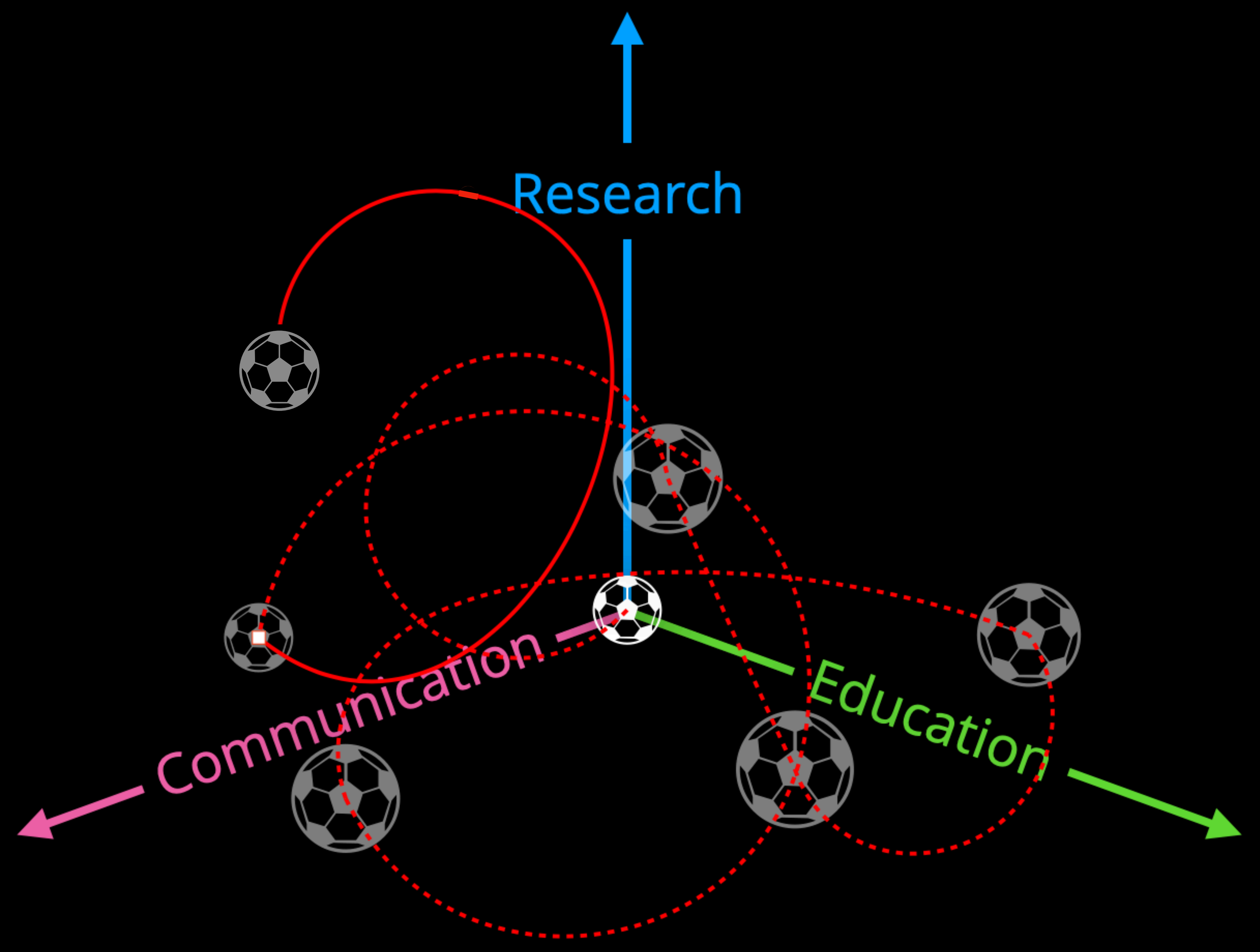
Technology




Science


Technology

Science + Technology = { Fun, Discovery }




"The Heavy Red Bag"
Technology
1993ApJ...407..175C
THE ASTROPHYSICAL JOURNAL, 407:175–184, 1993 April 10
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OH ZEEMAN OBSERVATIONS OF DARK CLOUDS
R. M. CRUTCHER,1 T. H. TROLAND,2 A. A. GOODMAN,3 C. HEILES,4 I. KAZÈS,5 AND P. C. MYERS3
Received 1992 August 3; accepted 1992 October 7
ABSTRACT
We have made measurements with the Green Bank 43 m telescope of the Zeeman effect in the 1665 and
1667 MHz lines of OH toward dark clouds. The typical 1 σ sensitivity was 3 μG. The only certain detection
of a magnetic field was toward B1, for which we measured a line-of-sight component |B| cos θ = −19.1 ± 3.9
μG. Comparison with our earlier measurement of the field toward B1 with the Arecibo telescope provided
evidence for a 40% enhancement in field strength between the molecular envelope and core of the B1 cloud,
which is consistent with quasi-static contraction of the cloud driven by ambipolar diffusion. Because the
Zeeman effect is only sensitive to the line-of-sight component of the magnetic field, a statistical analysis of the
and upper limits was necessary. This analysis indicated that the total (not line-of-sight) field strength
toward the central regions of dark clouds sampled by the Green Bank beam (for
), which implied that the central regions were approximately magneti-
found to be consistent with the hypotheses that (1) dark clouds are in approx-
and gravitational energy and (2) the supersonic line widths
motions such as Alfvén waves. The data were also consistent
subcritical clouds evolving on the ambipolar diffusion
THE ASTROPHYSICAL JOURNAL, 338:L61–L64, 1989 March 15
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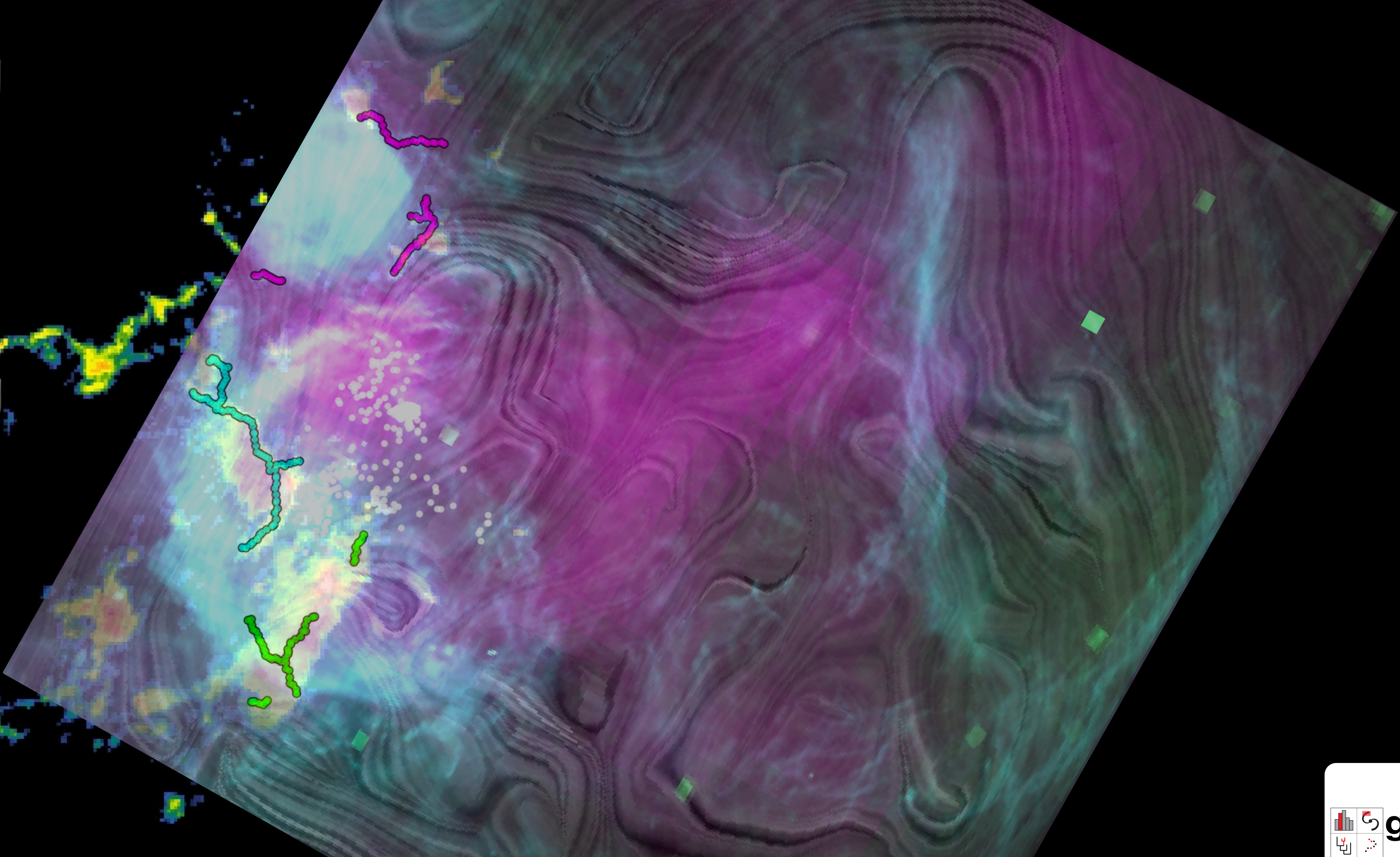
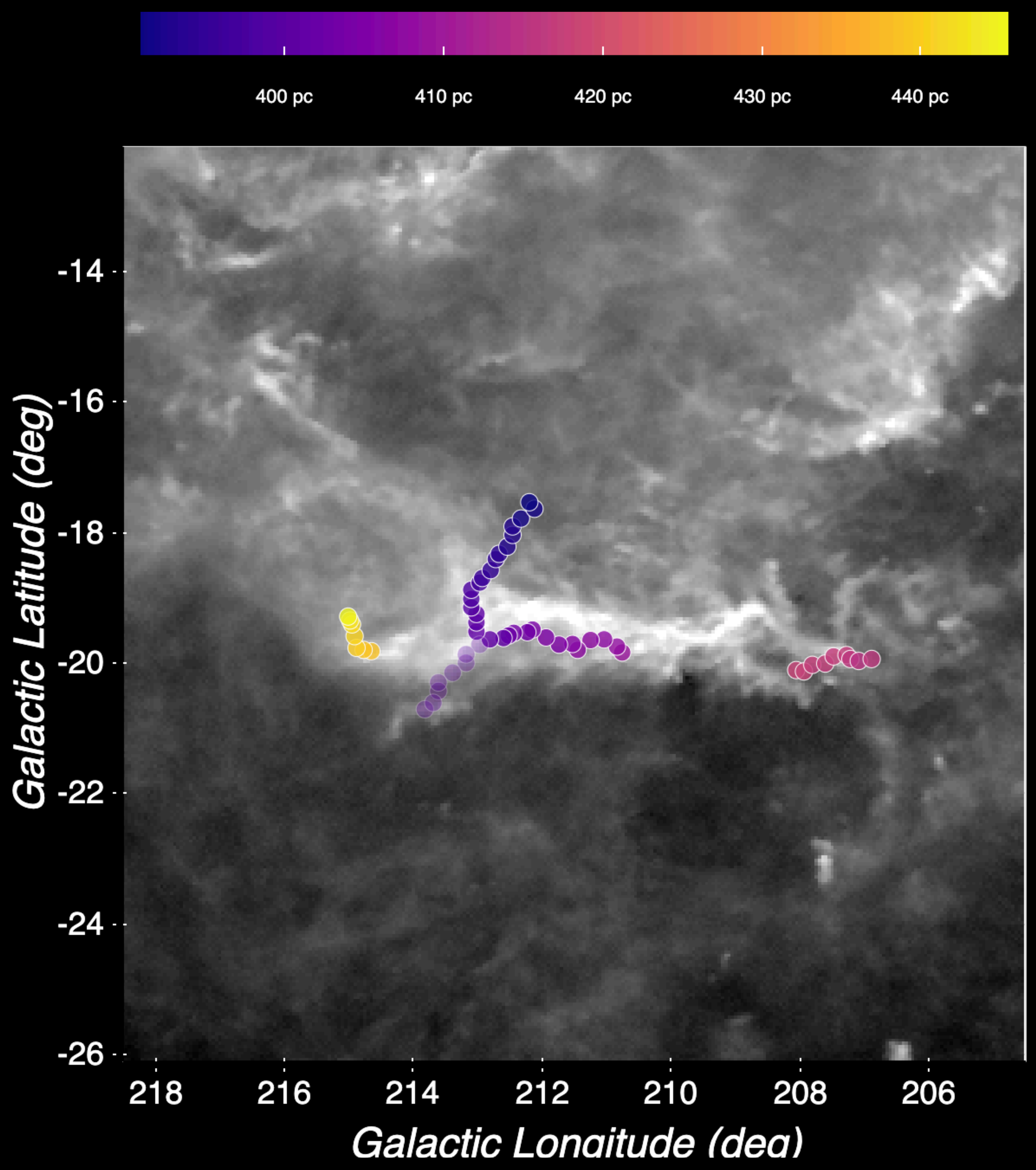
MEASUREMENT OF MAGNETIC FIELD STRENGTH IN THE DARK CLOUD BARNARD 1
A. A. GOODMAN,1,2 R. M. CRUTCHER,3 C. HEILES,4 P. C. MYERS,2 AND T. H. TROLAND5
Received 1988 August 30; accepted 1988 December 13
ABSTRACT
We report the detection of a −27 ± 4 μG magnetic field in the molecular cloud Barnard 1 (B1), via obser-
vations of the Zeeman effect in the 1665 and 1667 MHz lines of OH at the Arecibo 305 m telescope. The

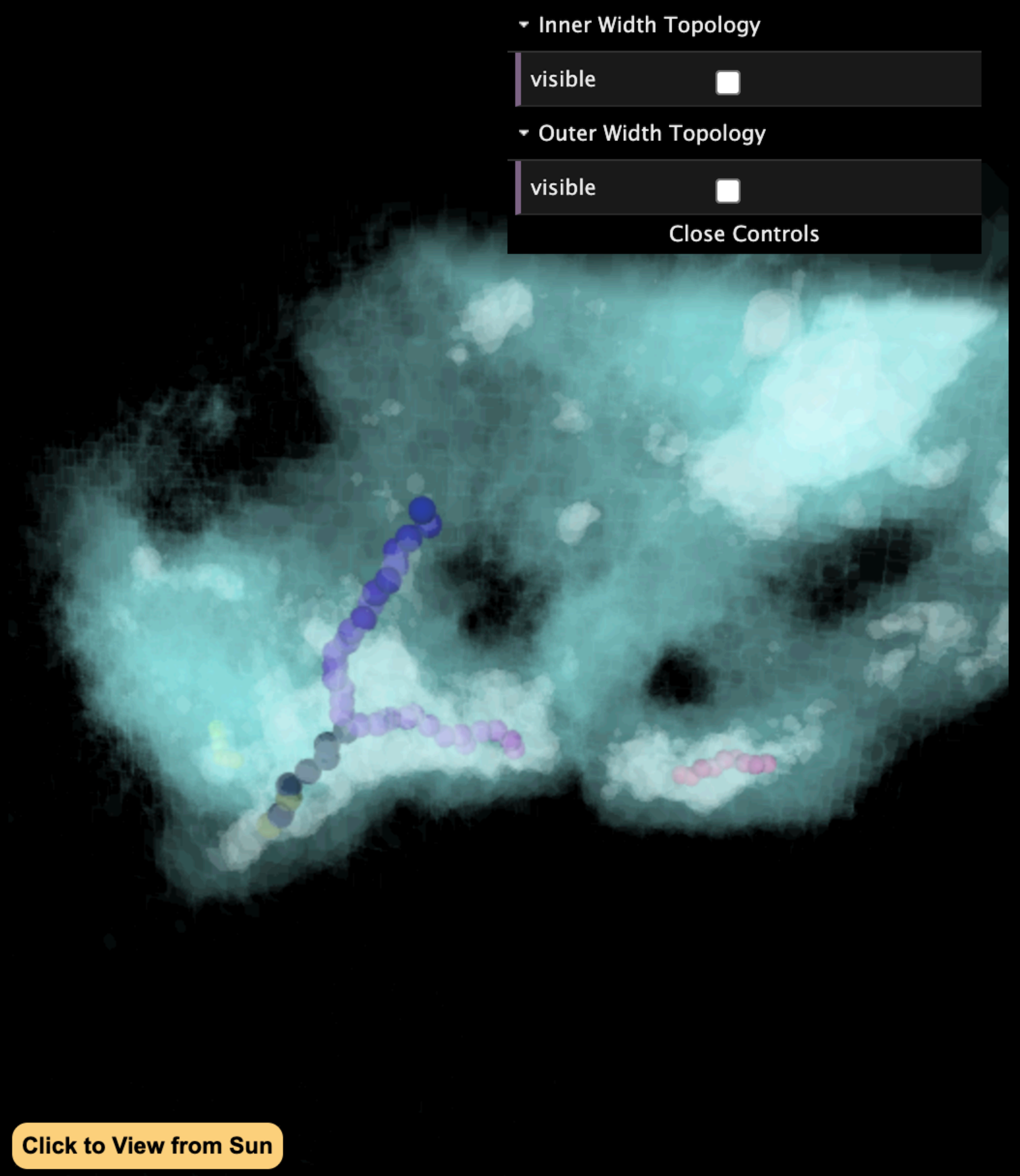
What I learned from Ron Maddalena in 1983: *we can map gas between stars in "3-D"**



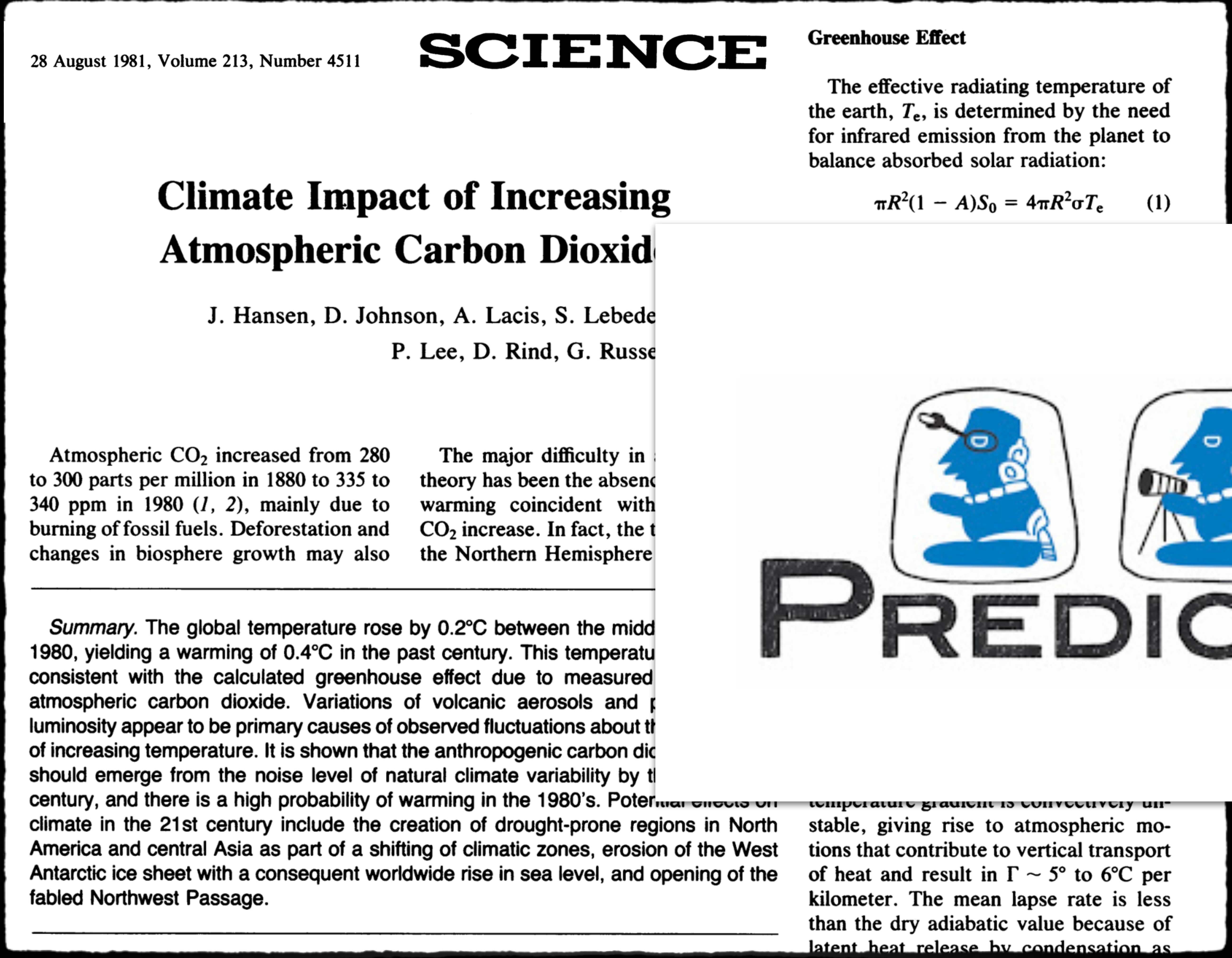
+ use polarimetry to (try to) figure out what magnetic fields look like in space, and that worked, 30 years later

Update since1983, just for Ron Maddalena: *we can map gas between stars in true 3-D*





What I learned from James Hansen in 1983: *a computer (simulation) can save humanity*



28 August 1981, Volume 213, Number 4511

SCIENCE

Climate Impact of Increasing Atmospheric Carbon Dioxid

J. Hansen, D. Johnson, A. Lacis, S. Lebede
P. Lee, D. Rind, G. Russe

Atmospheric CO_2 increased from 280 to 300 parts per million in 1880 to 335 to 340 ppm in 1980 (*1*, *2*), mainly due to burning of fossil fuels. Deforestation and changes in biosphere growth may also

The major difficulty in theory has been the absenc warming coincident with CO_2 increase. In fact, the t the Northern Hemisphere

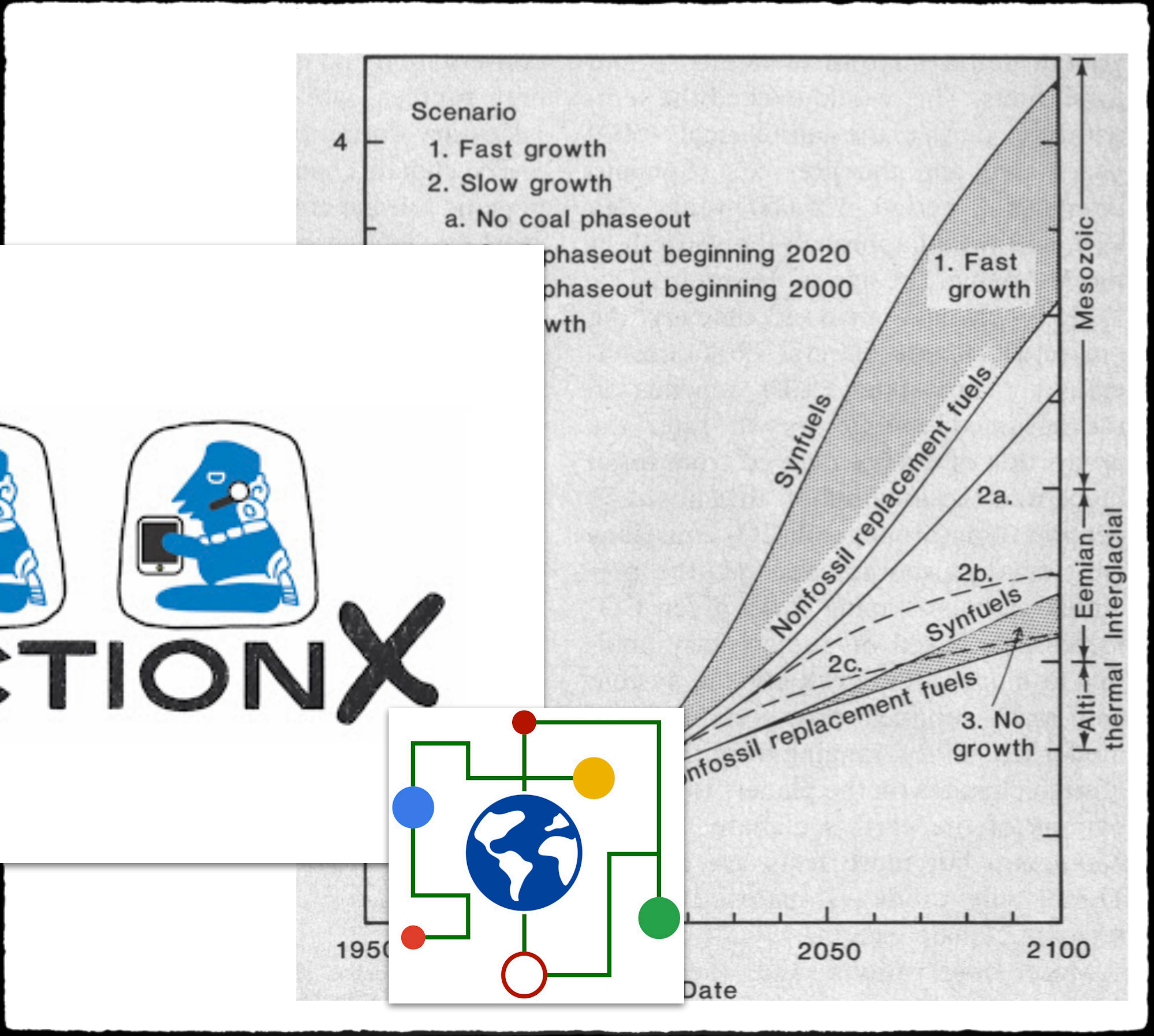
Summary. The global temperature rose by 0.2°C between the midd 1980, yielding a warming of 0.4°C in the past century. This temperatu consistent with the calculated greenhouse effect due to measured atmospheric carbon dioxide. Variations of volcanic aerosols and luminosity appear to be primary causes of observed fluctuations about th of increasing temperature. It is shown that the anthropogenic carbon dic should emerge from the noise level of natural climate variability by th century, and there is a high probability of warming in the 1980's. Potential effects on climate in the 21st century include the creation of drought-prone regions in North America and central Asia as part of a shifting of climatic zones, erosion of the West Antarctic ice sheet with a consequent worldwide rise in sea level, and opening of the fabled Northwest Passage.

Greenhouse Effect

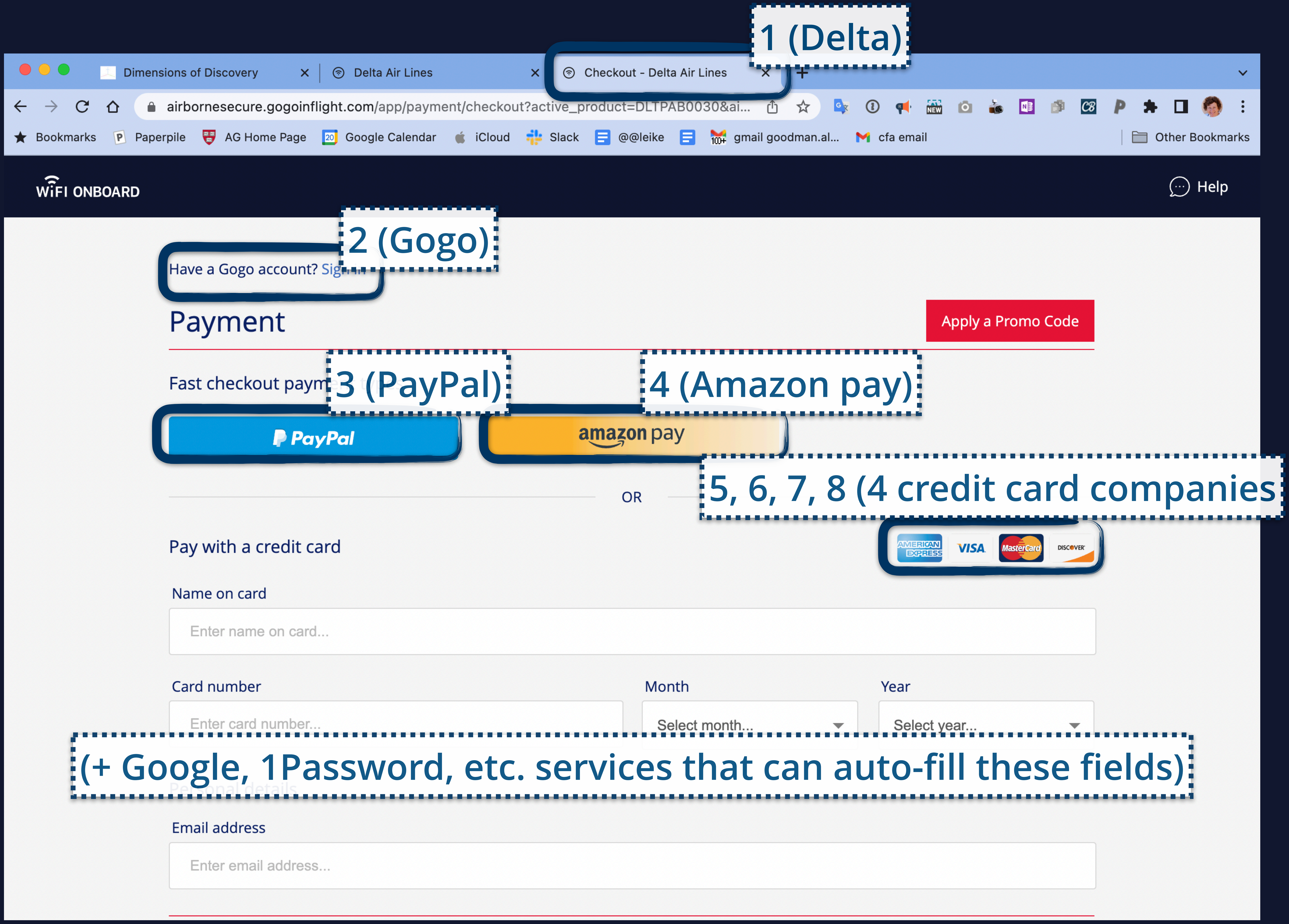
The effective radiating temperature of the earth, T_e, is determined by the need for infrared emission from the planet to balance absorbed solar radiation:

$$\pi R^2(1 - A)S_0 = 4\pi R^2 \sigma T_e \quad (1)$$

stable, giving rise to atmospheric motions that contribute to vertical transport of heat and result in $\Gamma \sim 5°$ to 6°C per kilometer. The mean lapse rate is less than the dry adiabatic value because of

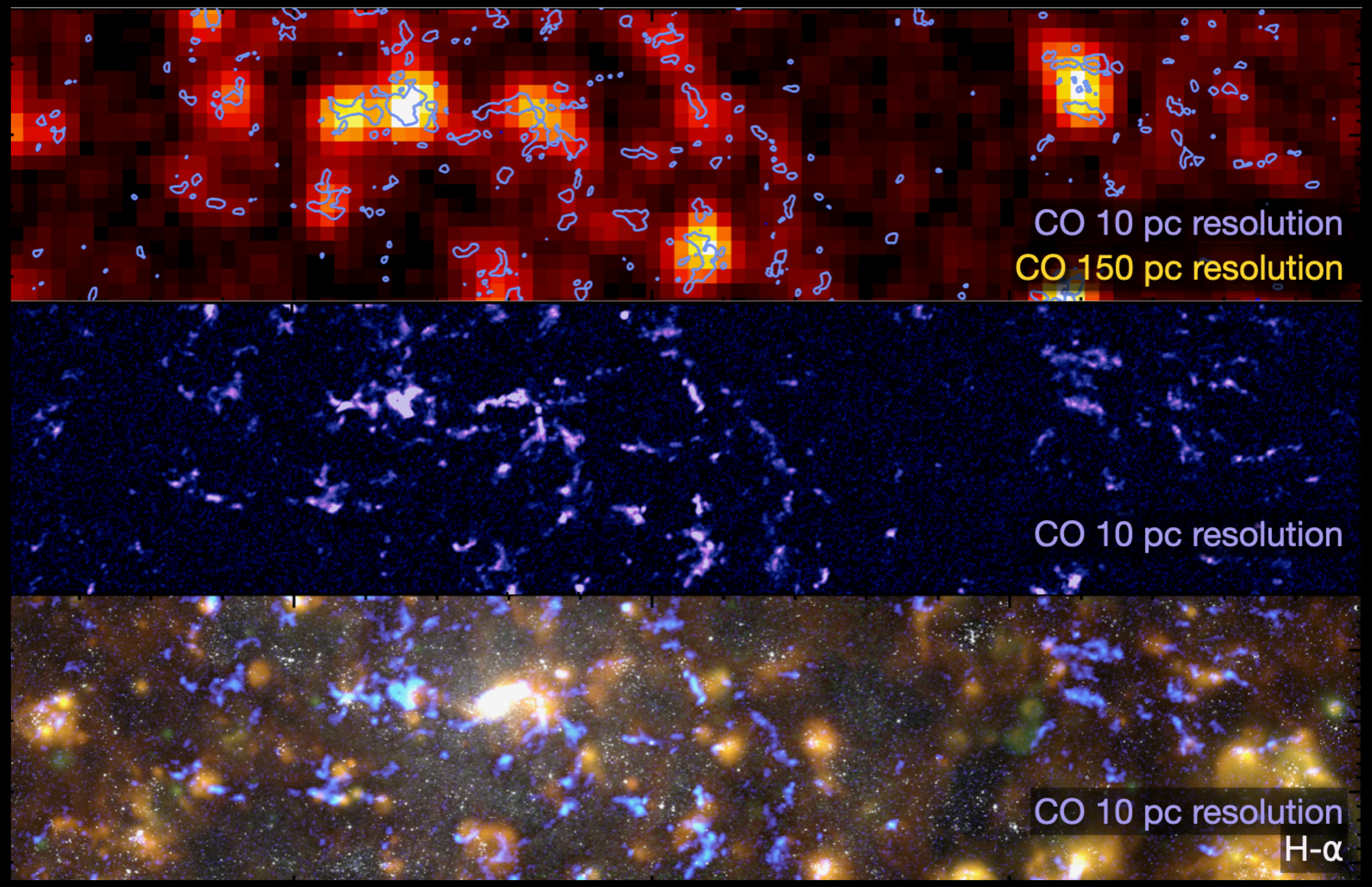


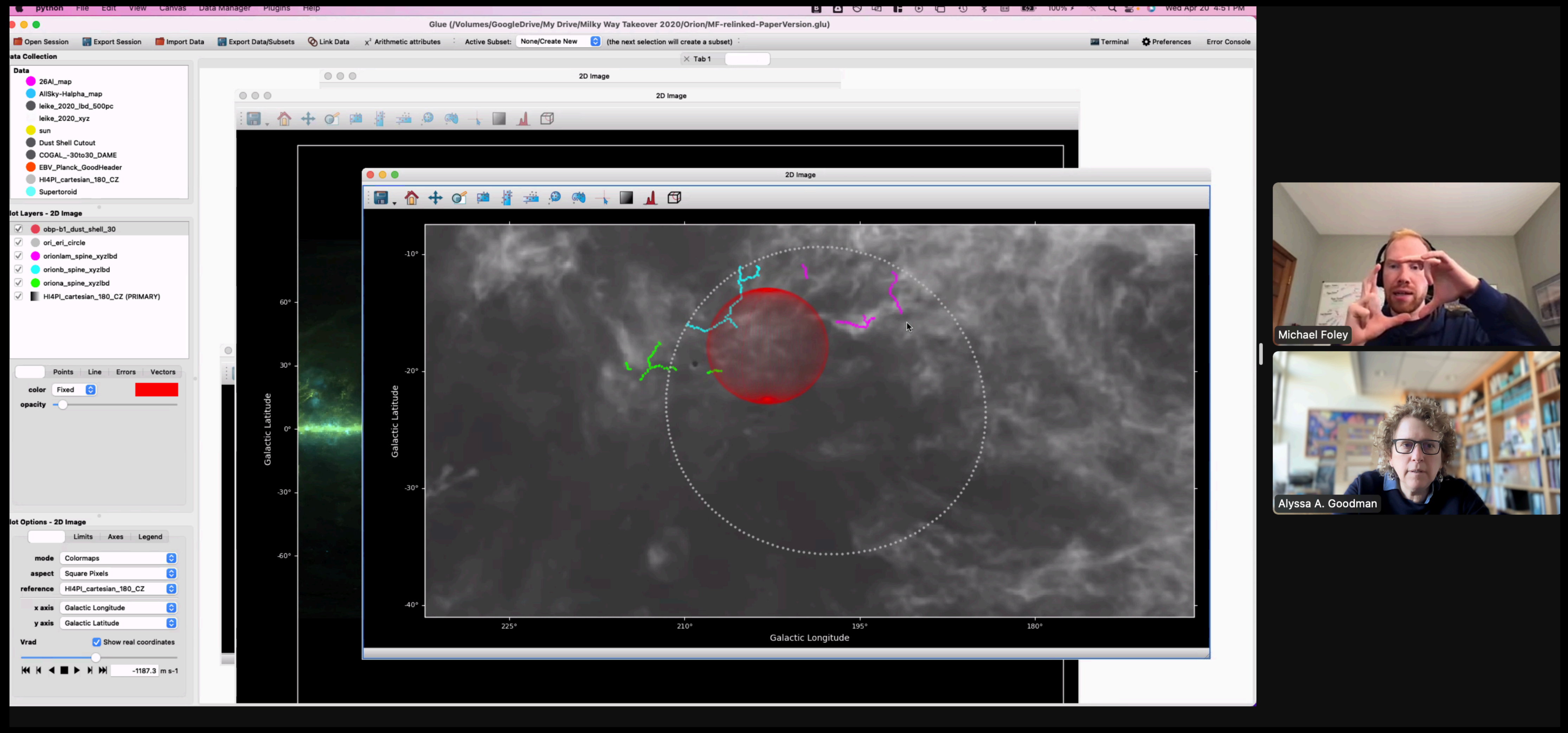
Seamless integration of technologies is part of life in 2022—it should be part of learning, research, and communication too.

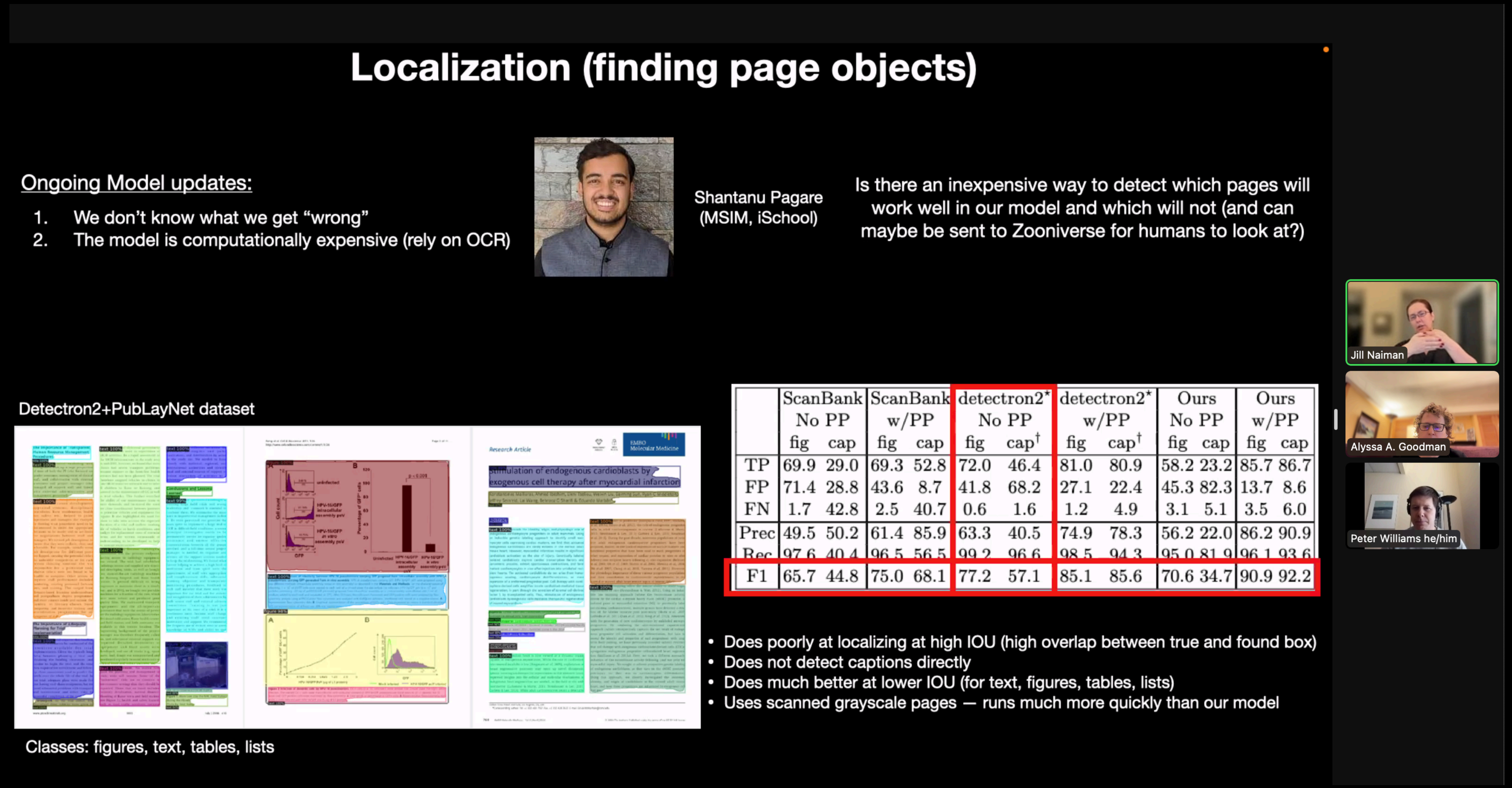


Screenshot of Delta Airlines' WiFi purchase page, on a very small plane, BOS:RIC, 4/22/22.

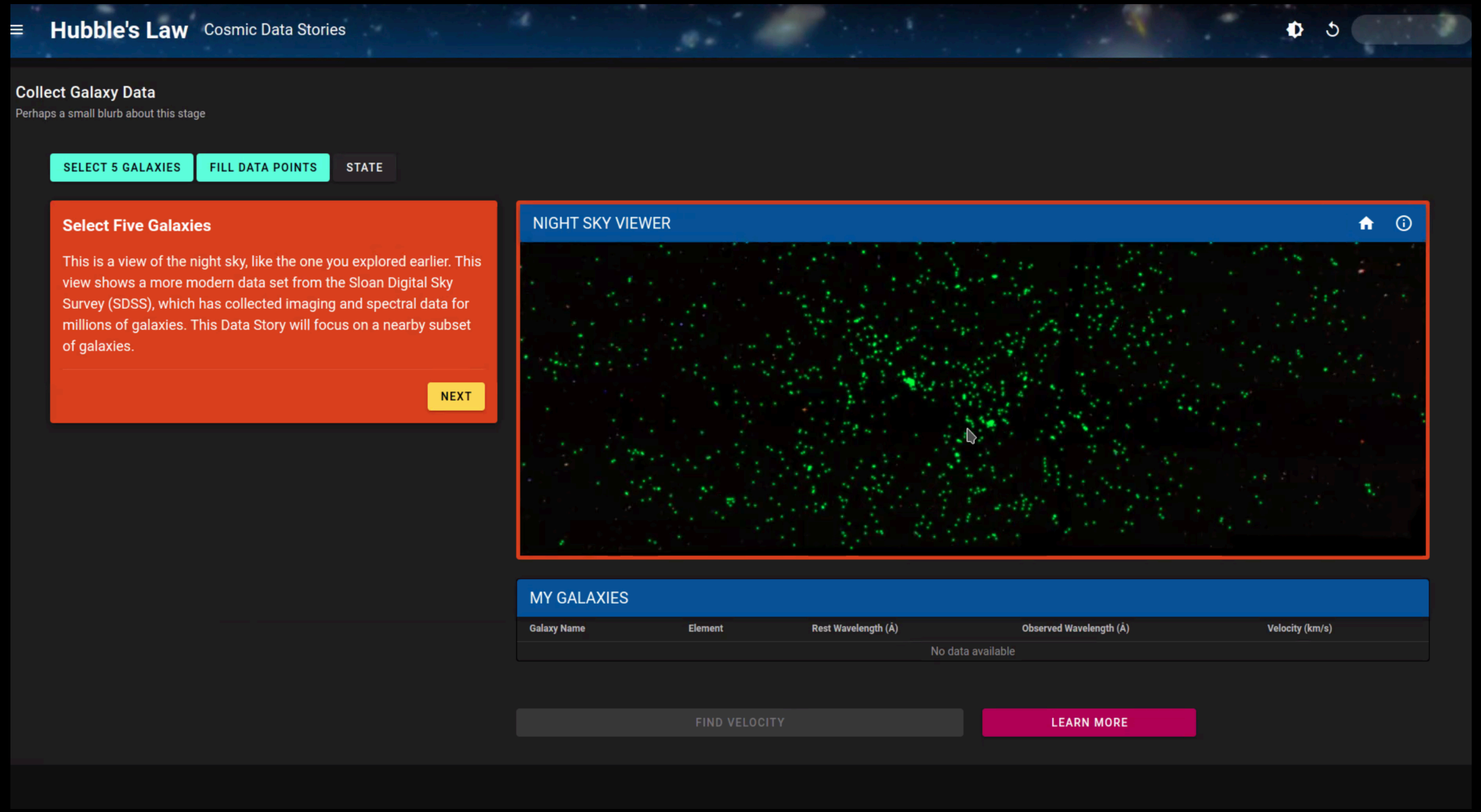
Dimensions of Discovery: “this Wednesday”







	ScanBank No PP fig	ScanBank No PP cap	ScanBank w/PP fig	ScanBank w/PP cap	detectron2* No PP fig	detectron2* No PP cap†	detectron2* w/PP fig	detectron2* w/PP cap†	Ours No PP fig	Ours No PP cap	Ours w/PP fig	Ours w/PP cap
TP	69.9	29.0	69.3	52.8	72.0	46.4	81.0	80.9	58.2	23.2	85.7	86.7
FP	71.4	28.8	43.6	8.7	41.8	68.2	27.1	22.4	45.3	82.3	13.7	8.6
FN	1.7	42.8	2.5	40.7	0.6	1.6	1.2	4.9	3.1	5.1	3.5	6.0
Prec	49.5	50.2	61.4	85.9	63.3	40.5	74.9	78.3	56.2	22.0	86.2	90.9
Rec	97.6	40.4	96.5	56.5	99.2	96.6	98.5	94.3	95.0	81.9	96.1	93.6
F1	65.7	44.8	75.0	68.1	77.2	57.1	85.1	85.6	70.6	34.7	90.9	92.2

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AAS WorldWide Telescope
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Guided Tours
Search
Community
Telescope
View
Settings
Sign In
Use Layer Manager to Control User Settings
Observing Location
Name: Microsoft Research Building 99
Lat : 47:38:32
Lng: -122:08:31
View from this location
Setup
Observing Time
2035/11/13 00:44:37
X 100000
UTC
Now
Layers
Earth
Mars
Jupiter
Saturn
Uranus
Neptune
Pluto
Sky
Overlays
Constellations
Grids
2D Sky
Show Solar System
Field of View Indicators
3d Solar System
Volumetric Milky Way
Stars (Hipparcos, ESA)
Planets (NASA, ETAL)
Planetary Orbits
Moon & Satellite Orbits
Asteroids (IAU MPC)
Lighting and Shadows
Sandbox
Dome
Overlays
Delete
Add
Paste
Reset
Name
Value
Time Scrubber
Time Series
Auto Loop
Look At
SolarSystem
Imagery
3D Solar System View
Tracking
Sun
Context Search Filter
All
5 of 2
Planet Size
Actual
Large
2.1 au