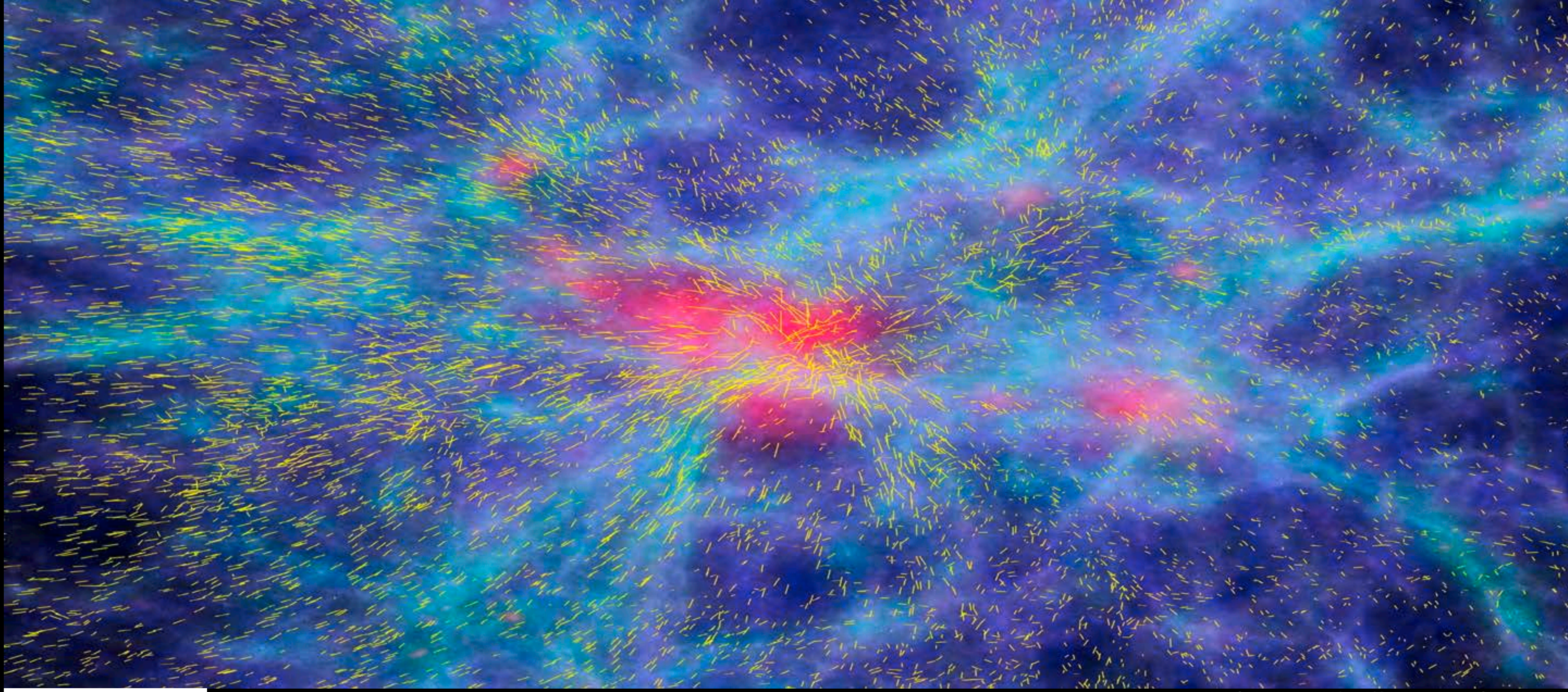
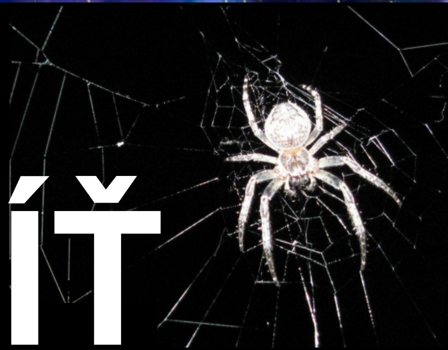
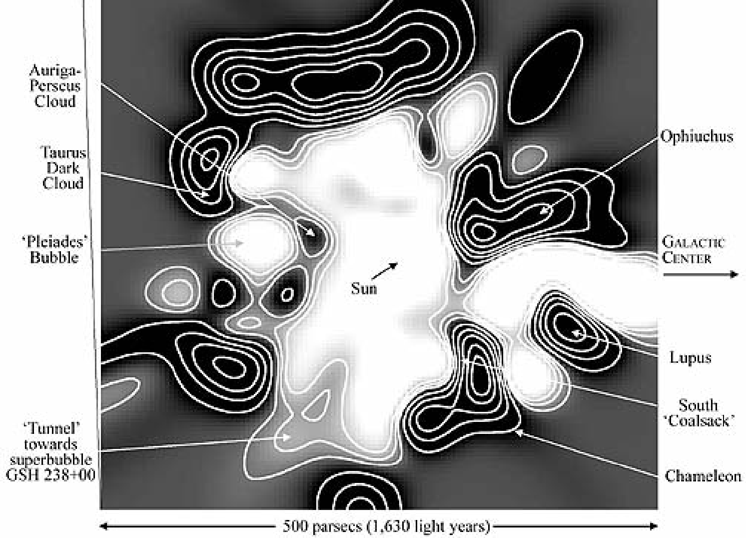


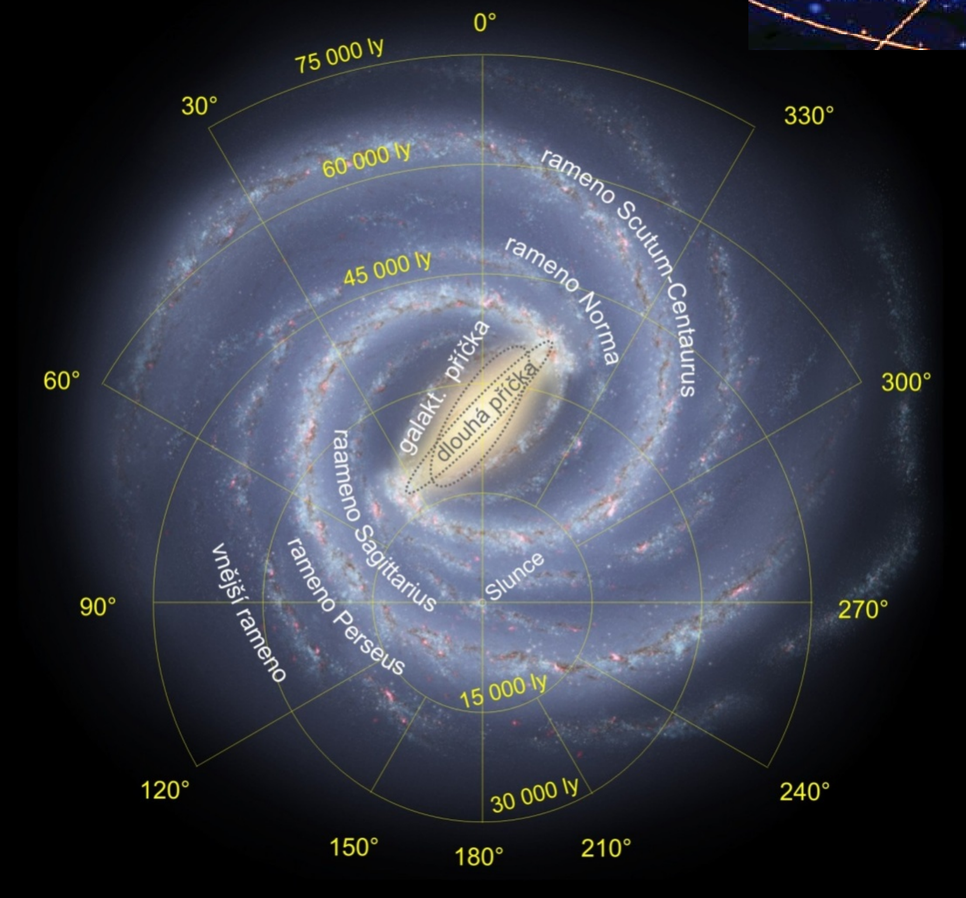
KOSMICKÁ SÍŤ



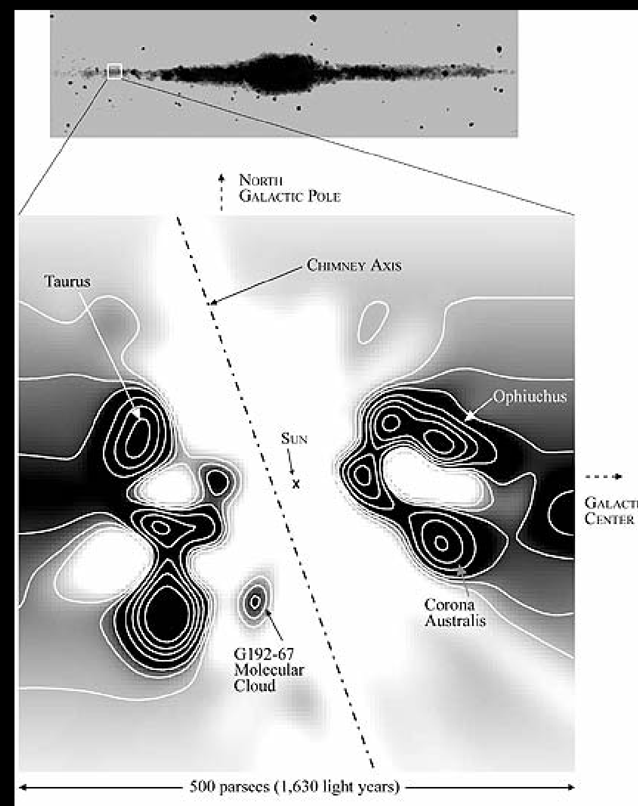
Hvězdárna Zlín 2014,
z internetu vykradl
a sestavil Ivan Havlíček



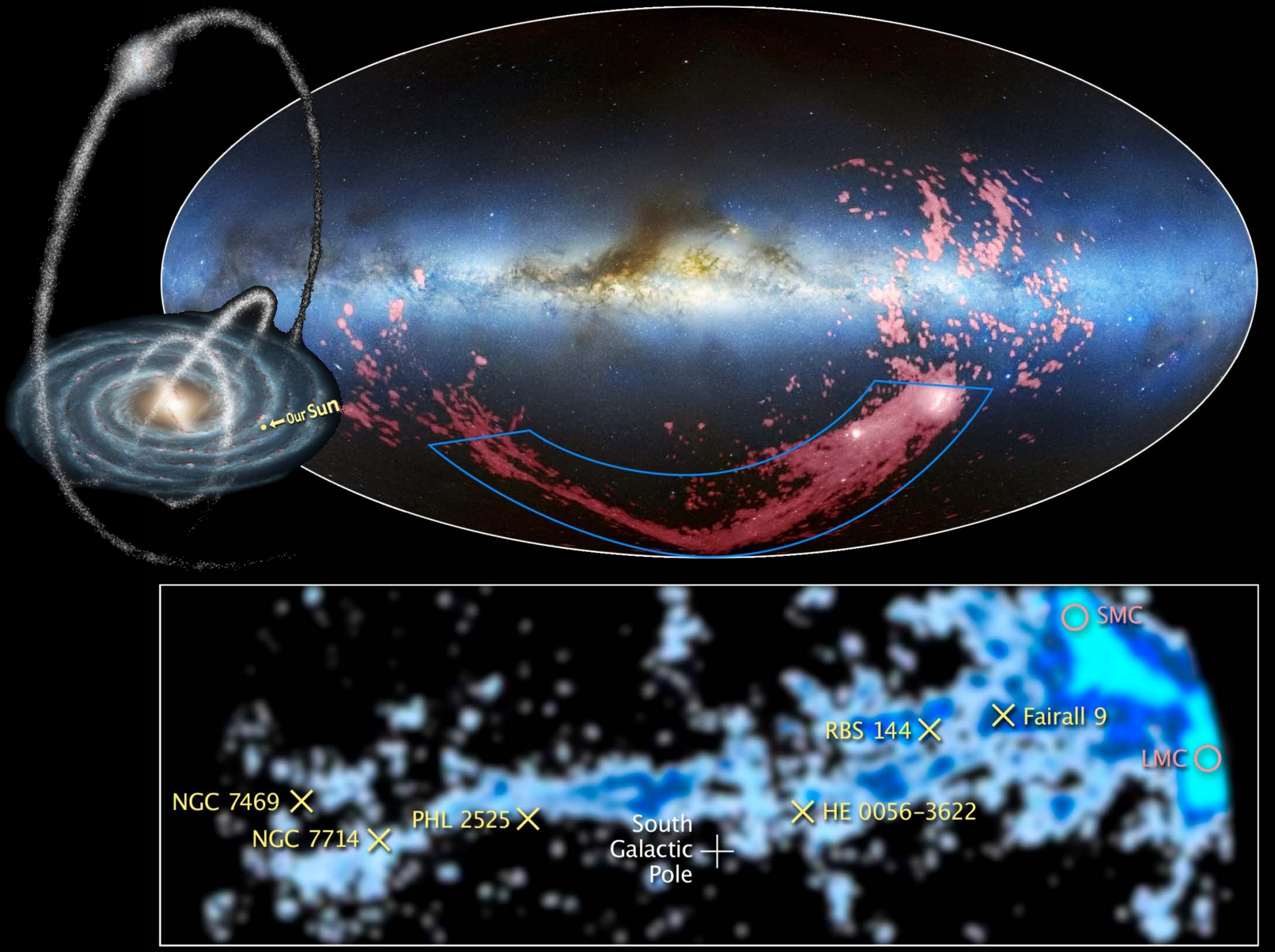
Auriga-Perseus Cloud
Taurus Dark Cloud
'Pleiades' Bubble
'Tunnel' towards superbubble GSH 238+00
Sun
Ophiuchus
Galactic Center
Lupus
South 'Coalsack'
Chameleon
500 parsecs (1,630 light years)



0°
30°
330°
60°
300°
90°
270°
120°
240°
150°
180°
210°
75 000 ly
60 000 ly
45 000 ly
15 000 ly
30 000 ly
rameno Scutum-Centaurus
rameno Norma
galakt. příčka
dlouhá příčka
raameno Sagittarius
rameno Perseus
vnější rameno
Slunce



North Galactic Pole
Chimney Axis
Taurus
Ophiuchus
Sun
Galactic Center
Corona Australis
G192-67 Molecular Cloud
500 parsecs (1,630 light years)



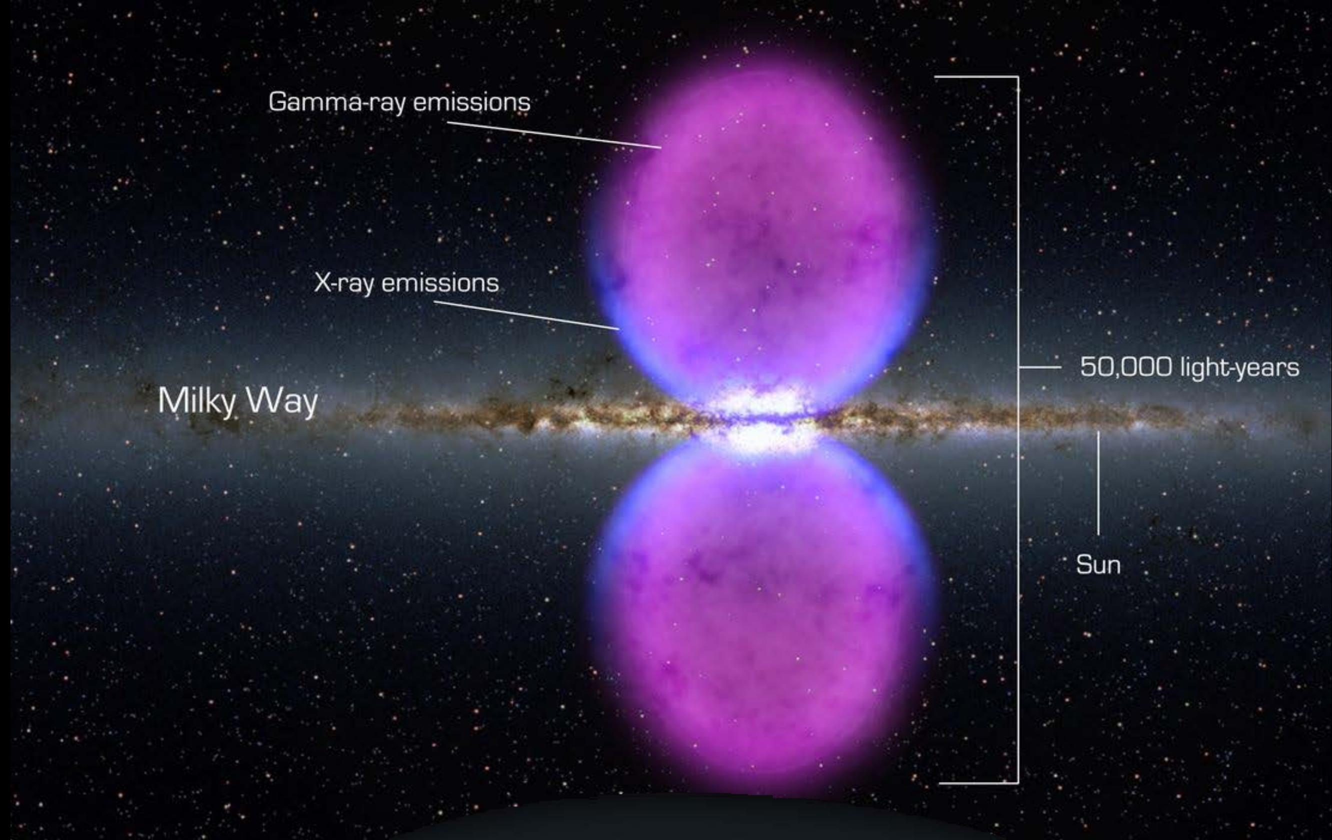
Our Sun
SMC
Fairall 9
RBS 144
LMC
NGC 7469
PHL 2525
HE 0056-3622
NGC 7714
South Galactic Pole

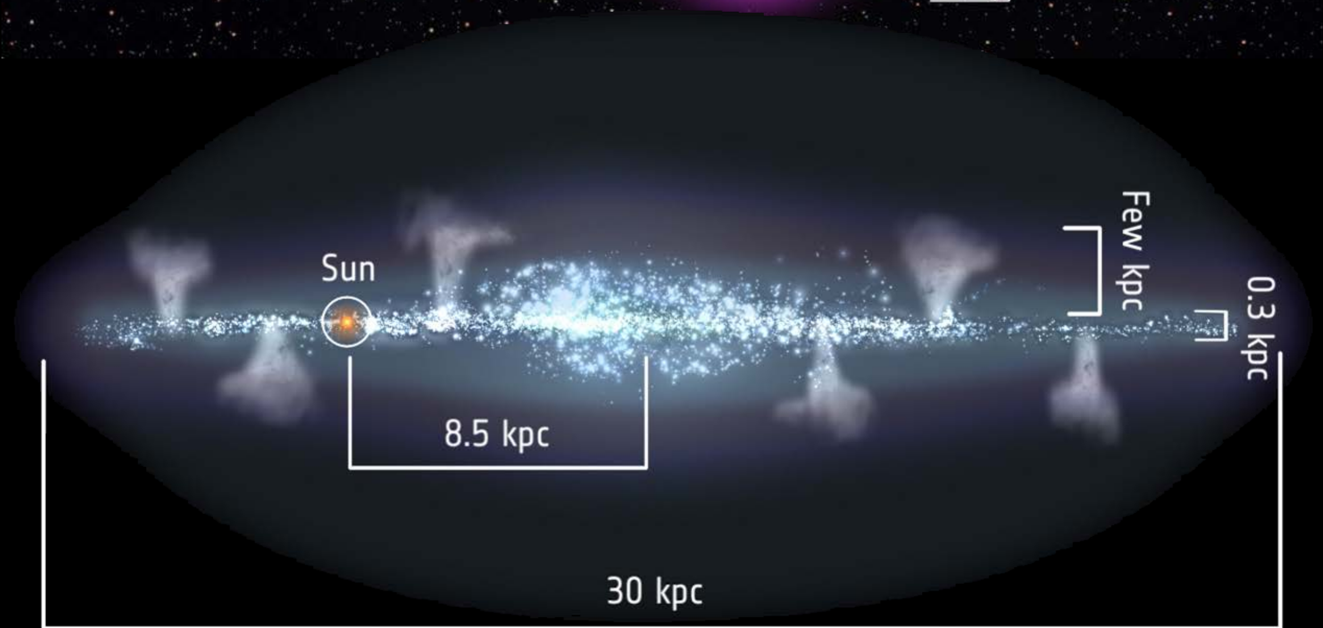
From end to end, the gamma-ray bubbles extend 50,000 light-years, or roughly half of the Milky Way's diameter, as shown in this illustration. The bubbles stretch across 100 degrees, spanning the sky from the constellation Virgo to the constellation Grus.

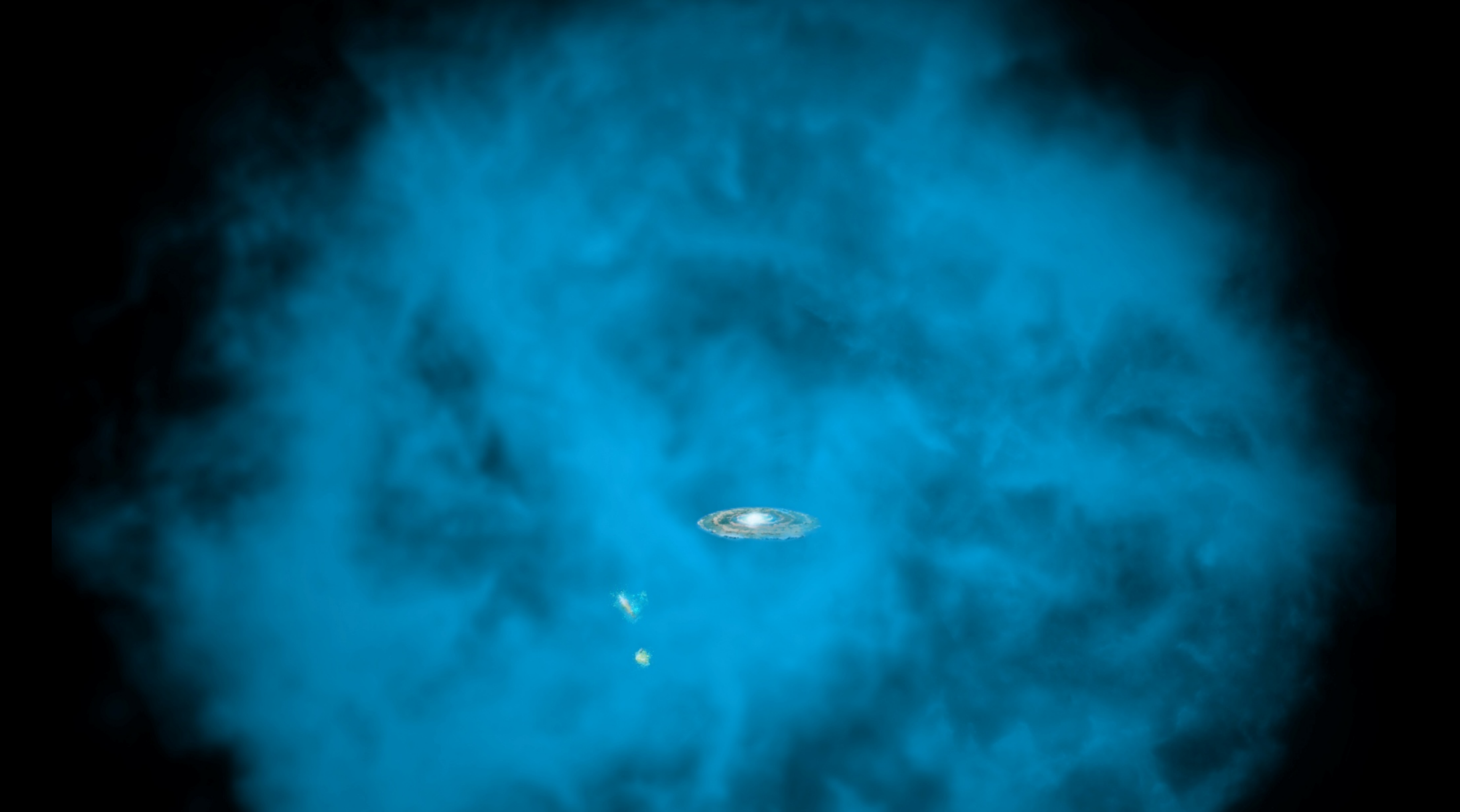
If the structure were rotated into the galaxy's plane, it would extend beyond our solar system. Hints of the bubbles' edges were first observed in X-rays (blue) by ROSAT (Röntgen Satellite), a Germany-led mission operating in the 1990s. The gamma rays mapped by Fermi (magenta) extend much farther from the galaxy's plane. A giant gamma-ray structure emerges by processing Fermi all-sky data at energies from 1 to 10 GeV.

A supermassive black hole weighing about 4 million times the sun's mass also lurks in the galactic center; these "gamma-ray bubbles" may have arisen as a result of a past eruption by the black hole or another source near the galactic center.

Zdroj: http://svs.gsfc.nasa.gov/vis/a010000/a010600/a010688/



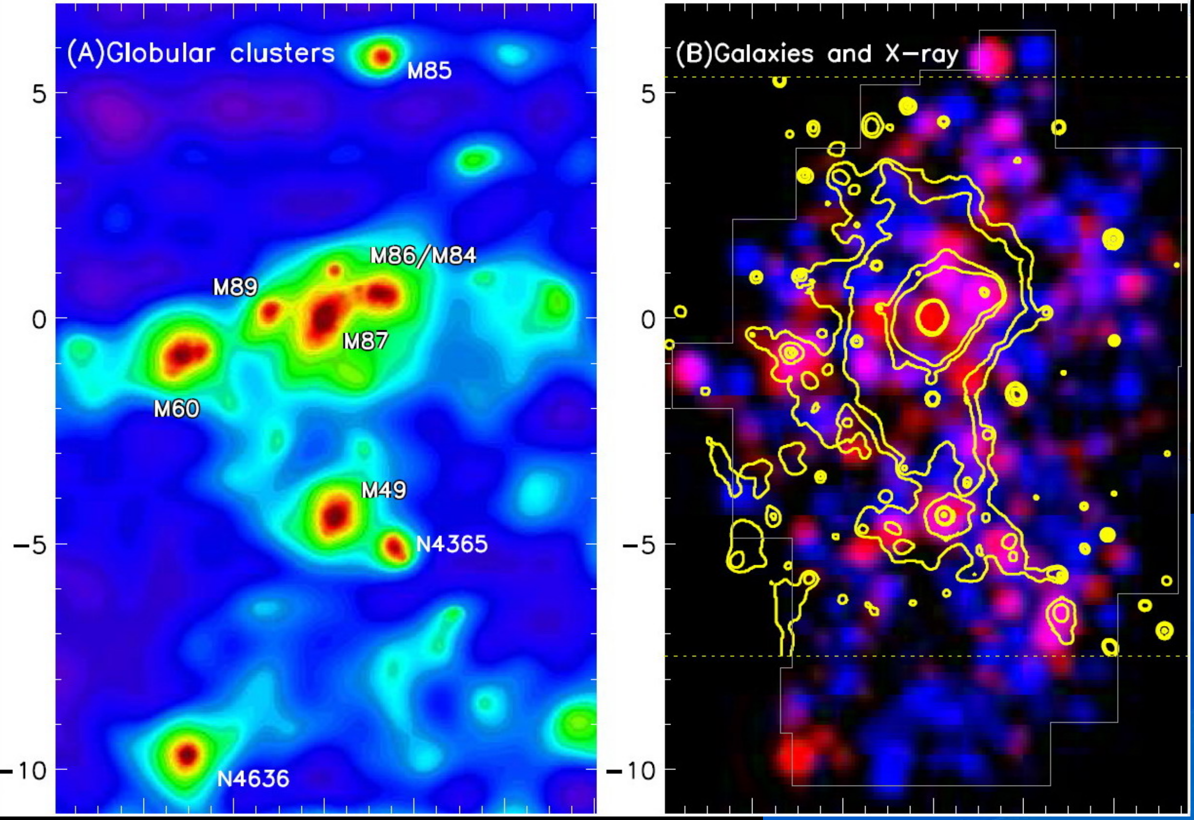


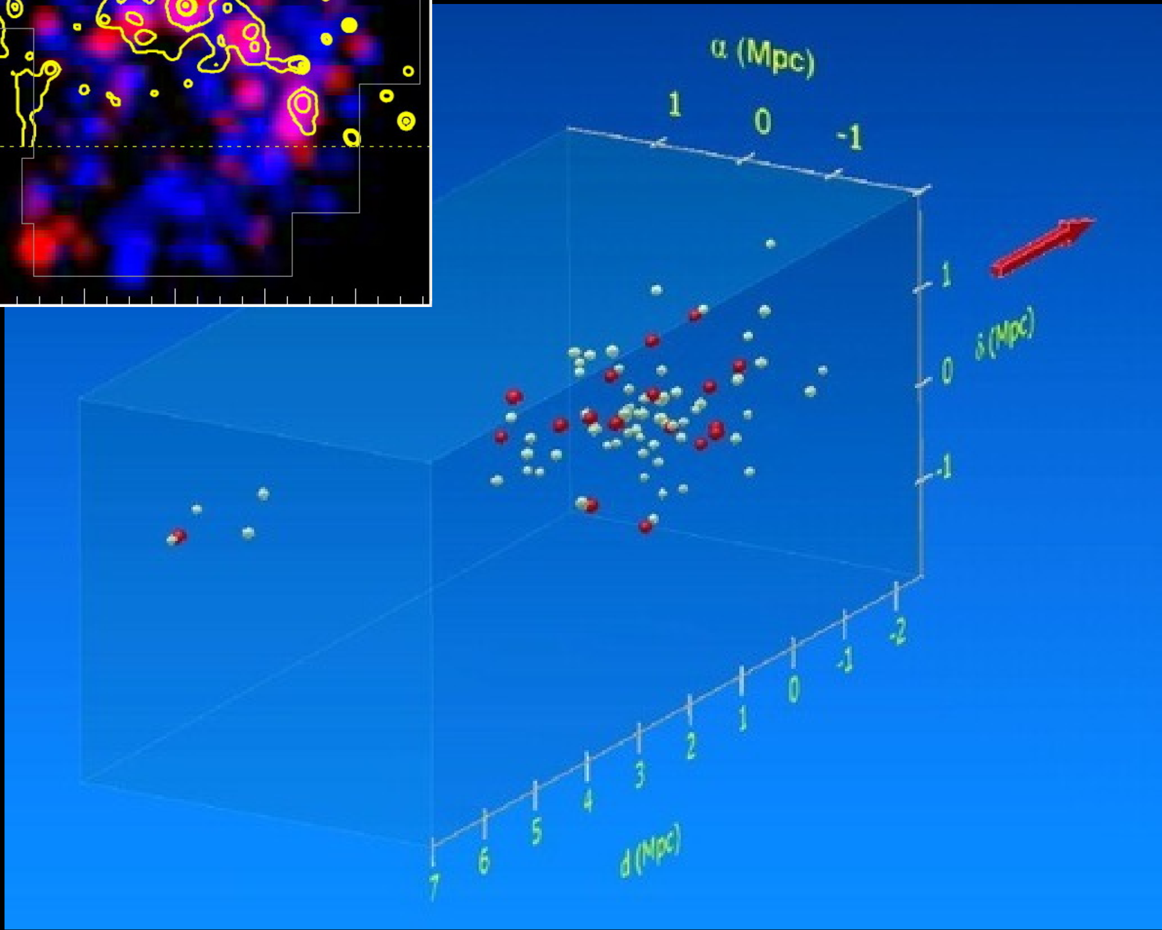


The halo of gas is shown with a radius of about 300,000 light years, although it may extend significantly further. Chandra observed eight bright X-ray sources located far beyond the Galaxy at distances of hundreds of millions of light years. The data revealed that X-rays from these distant sources are selectively absorbed by oxygen ions in the vicinity of the Galaxy. The nature of the absorption allowed the scientists to determine that the temperature of the absorbing halo is between 1 million and 2.5 million Kelvins.
Other studies have shown that the Milky Way and other galaxies are embedded in warm gas, with temperatures between 100,000 and one million degrees, and there have been indications that a hotter component with a temperature greater than a million degrees is also present. This new research provides evidence that the mass in the hot gas halo enveloping the Milky Way is much greater than that of the warm gas.
Zdroj: http://chandra.harvard.edu/press/12_releases/press_092412.html

Virgo I Cluster

VZDÁLENOST: 52 × 10^6 ly do středu
POČET GALAXIÍ: 200 (160 velkých)
NEJJASNĚJŠÍ ČLEN: M49 (m 9,3)

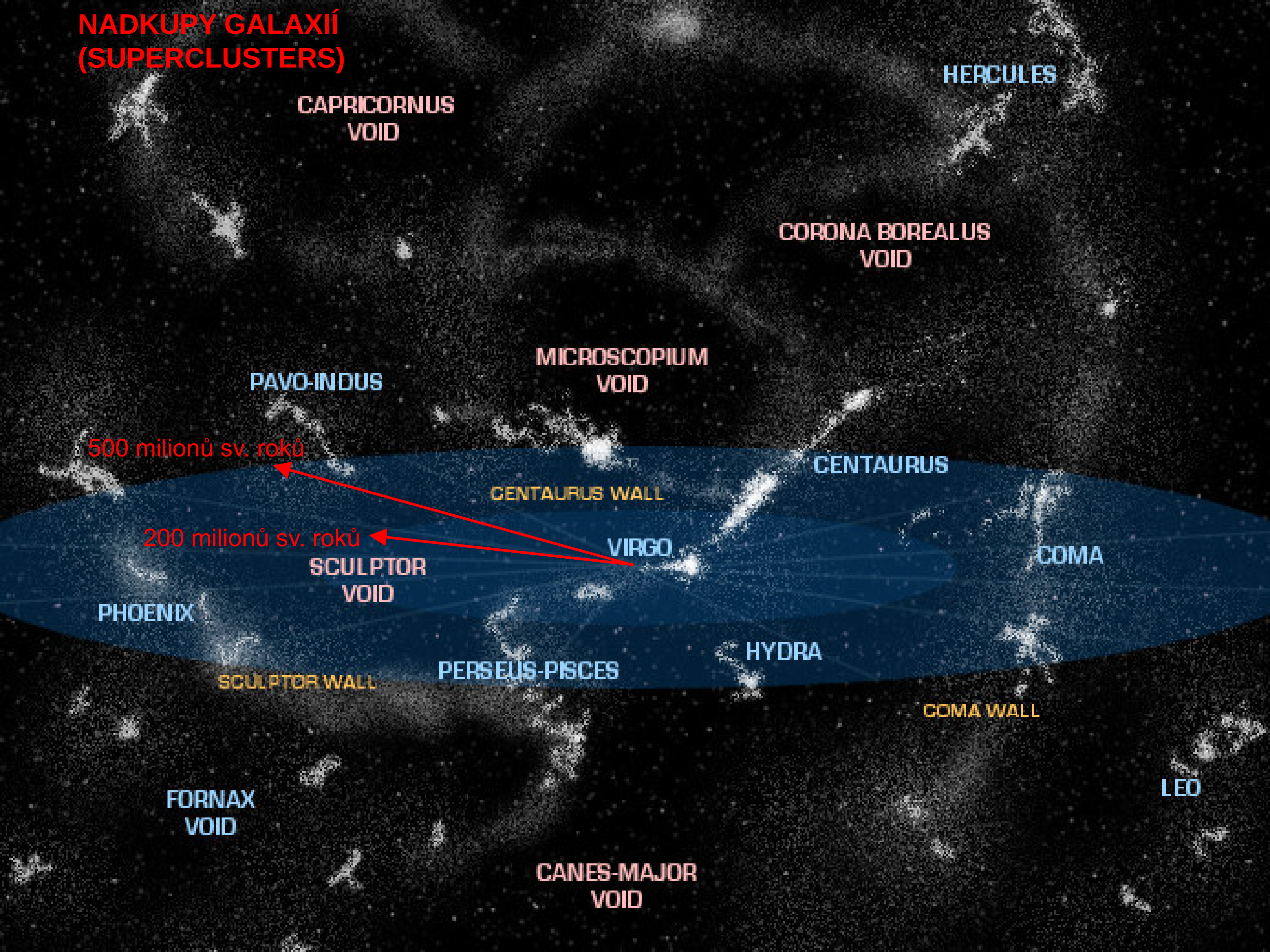




Projection of the three-dimensional structure of the Virgo Cluster from Mei et al. (2007). The cluster is embedded in a rectangular parallelepiped of dimensions 4 × 4 × 9.5 Mpc. The red spheres show galaxies with $B_T < 12$ mag. The direction of the Milky Way is indicated by the arrow. Note the five members of the W' Cloud at ≈ 23 Mpc.

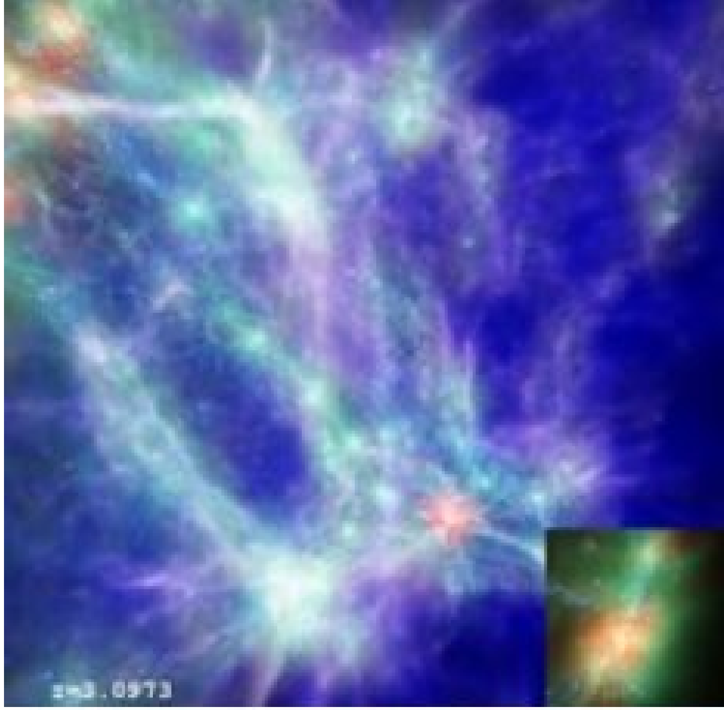
https://www.astrosci.ca/users/VCSFCS/Science_Highlights.html

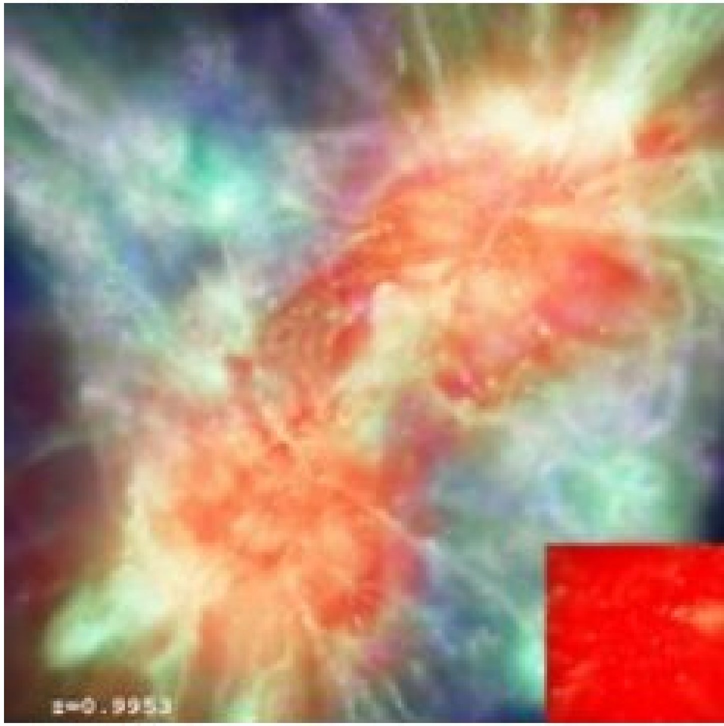
NADKUPY GALAXIÍ (SUPERCLUSTERS)



The evolution of a galaxy cluster from very early times on. The vizualisation starts when the universe has just 5% of its actual age, and the first galaxies are forming (about z=6). The light would need about 30 millions of years to pass the region of space shown. Shown is the temperature of the plasma, which fills the space between stars and galaxies. At z about 3.5 the universe has 15% of its actual age and the forming large-scale structure (filaments) can be clearly recognized. The inlay down in the right shows a zoom into the interior of one of the two prominent protoclusters. In such structures (clusters of galaxies) several thousands of galaxies can be bound by gravity. At z about 0.8 the universe is half as old as now and the two prominent protoclusters begin to merge into one galaxy cluster. Such events are the most energetic phenomena since universe was born in the Big Bang. In the final phase of this merging event a gigantic shockwave is initiated, releasing enormous amount of energy.

http://www.mpa-garching.mpg.de/galform/data_vis/index.shtml

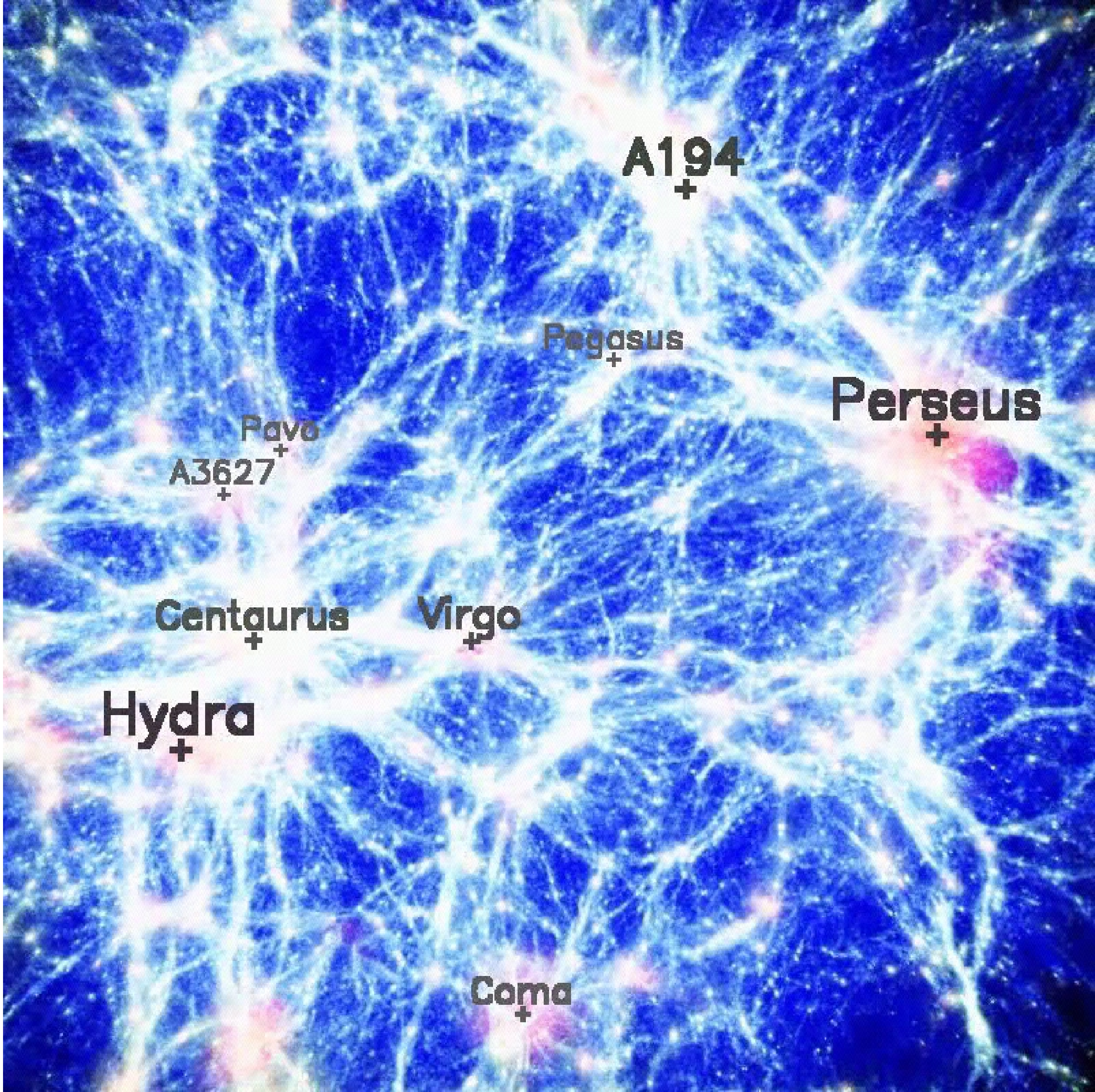


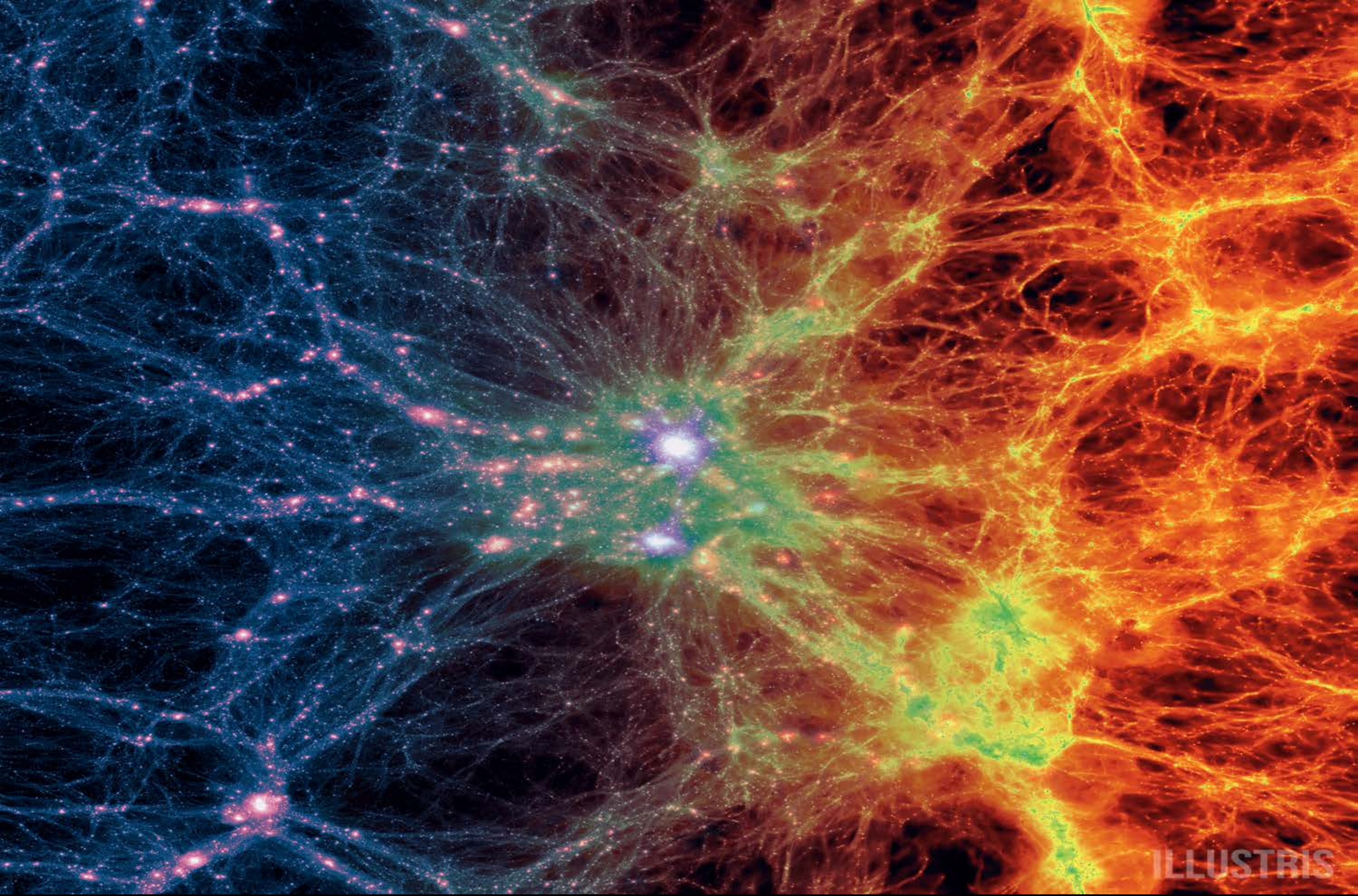


Flying through the "Local Universe"

Same simulation as done in the constrained realization project but including diffuse baryons. Visualized is the gas temperature. Structures which can be identified directly with observed galaxy clusters are labeled.

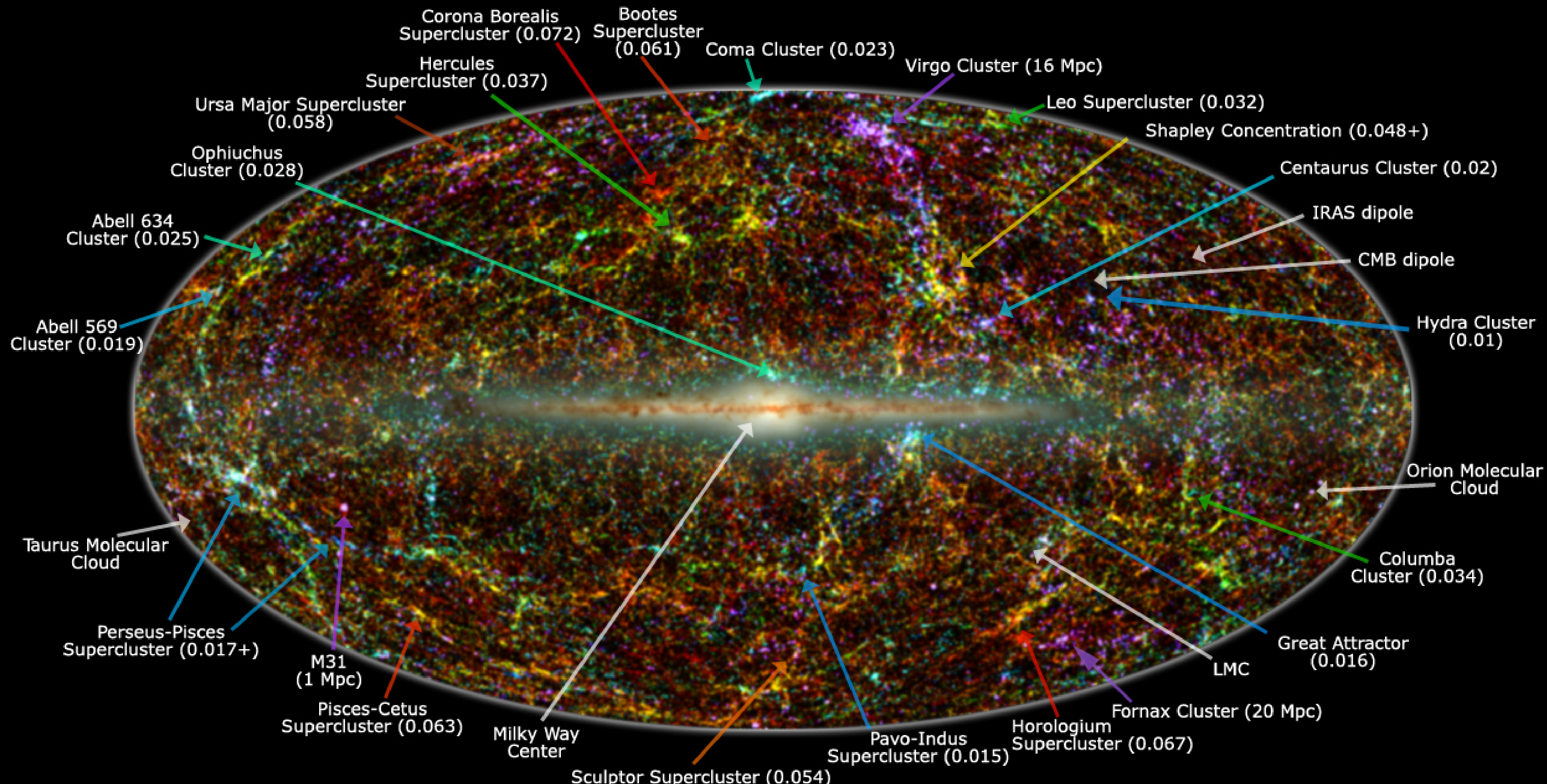
Zdroj: http://www.mpa-garching.mpg.de/galform/data_vis/index.shtml#virgo





Time evolution of a 10Mpc (comoving) region within Illustris from the start of the simulation to z=0.
The movie transitions between the dark matter density field, gas temperature and gas metallicity
(blue: cold, green: warm: white: hot).
Zdroj: http://www.illustris-project.org/media/

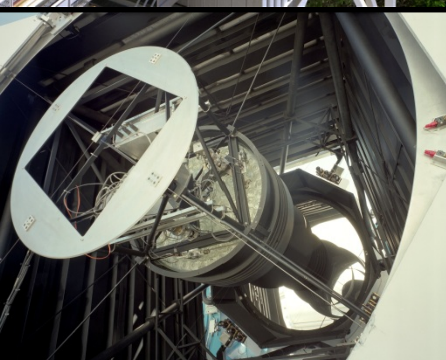
Large Scale Structure in the Local Universe



Legend: image shows 2MASS galaxies color coded by redshift (Jarrett 2004); familiar galaxy clusters/superclusters are labeled (numbers in parenthesis represent redshift). Graphic created by T. Jarrett (IPAC/Caltech)

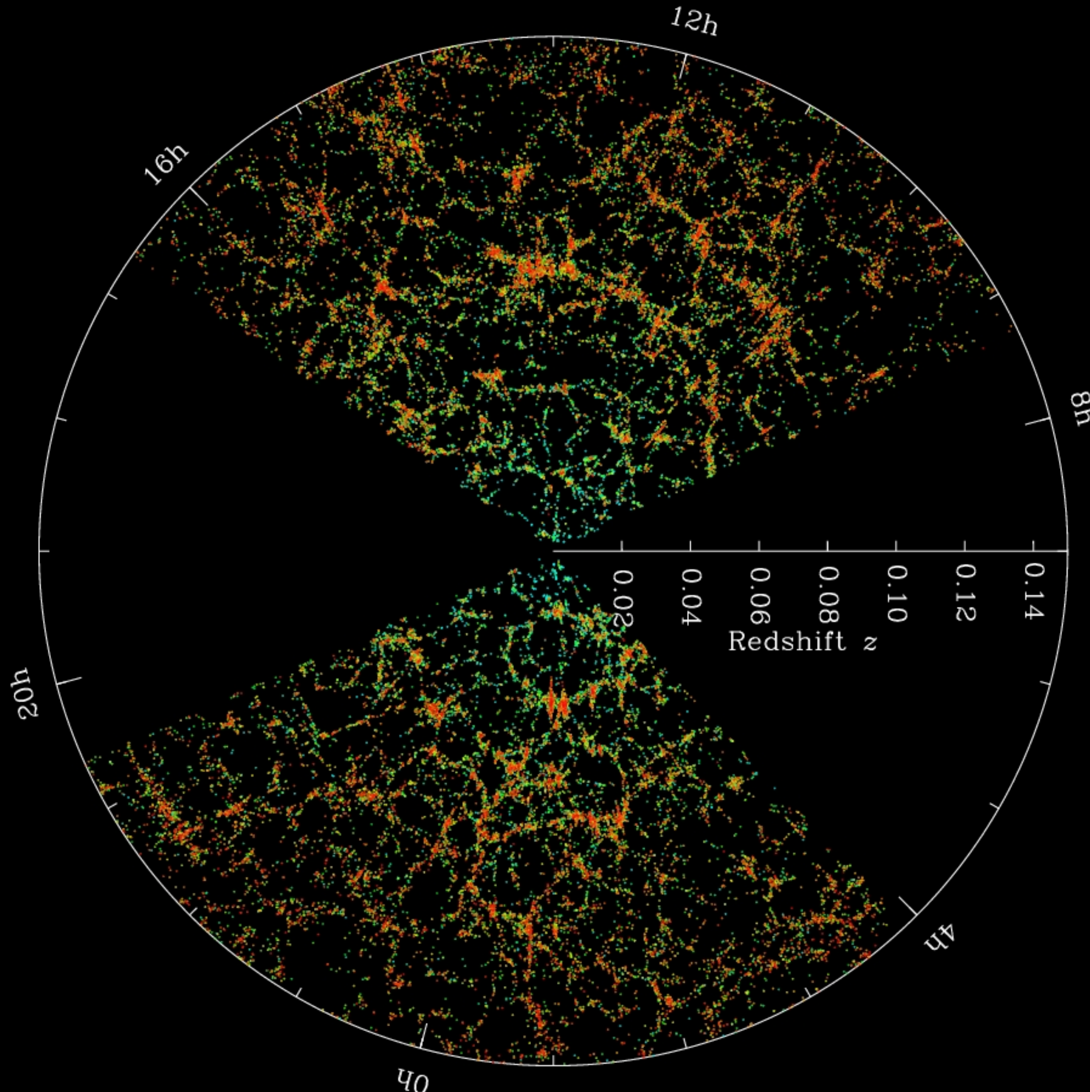
PŘEHLÍDKOVÝ PROJEKT SDSS

Apache Point Observatory, New Mexico



Primární zrcadlo	Ø 2,5 m, f/2,25
Sekundární zrcadlo	Ø 1,08 m
Vstupní apertura	Ø 1,30 m
Otvor v primárním zrcadle	Ø 1,17 m
Ohnisková rovina pro snímání	Ø 0,76 m
Vzdálenost zrcadel	3,6 m
Zorné pole	3°.

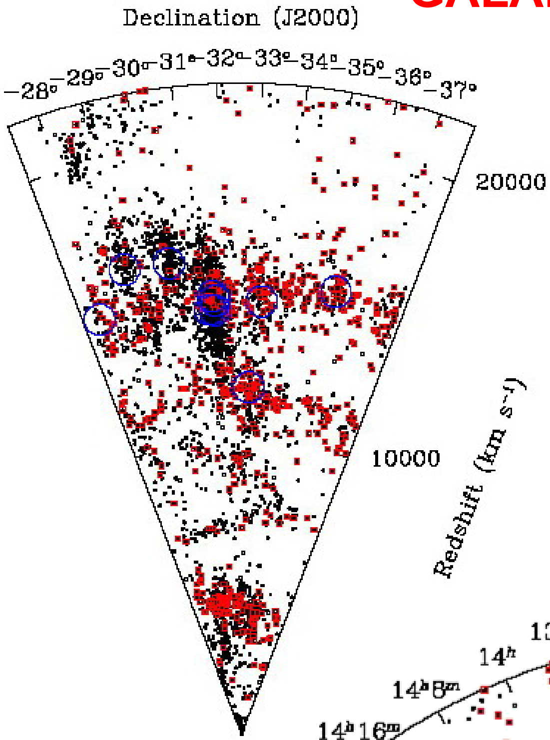
http://www.sdss.org/

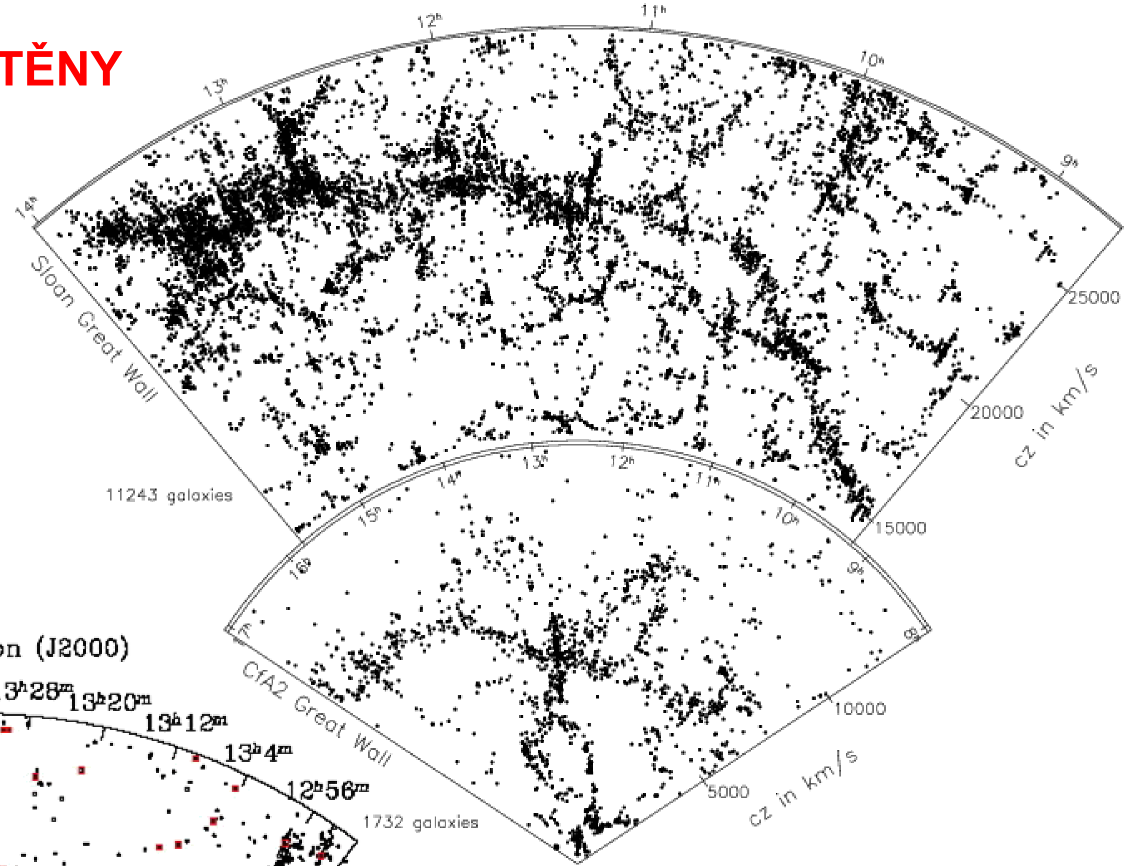


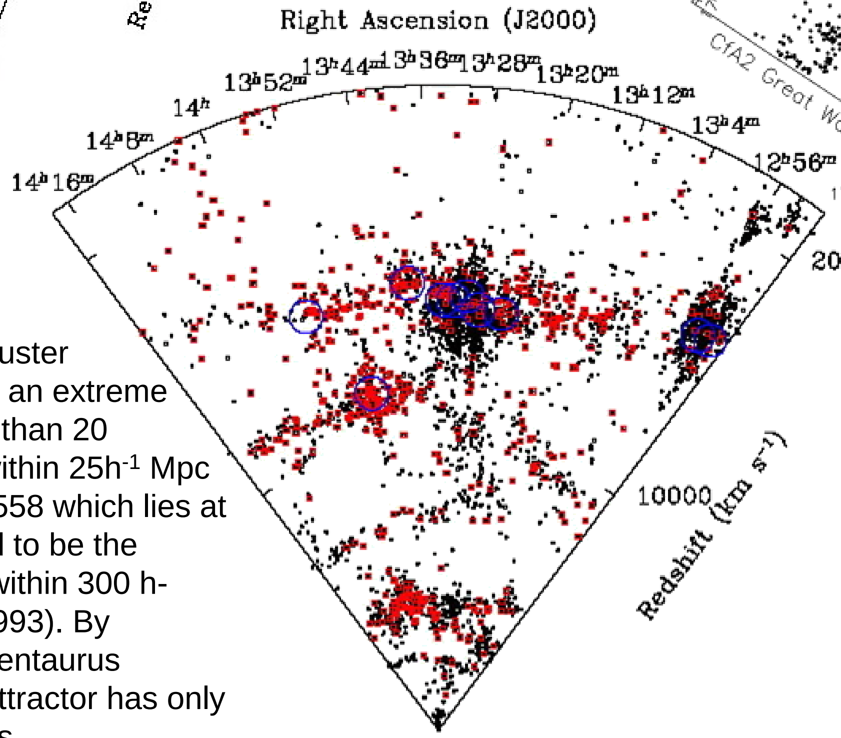
Prostorové rozložení svítící hmoty v záznamovém poli SDSS

Sloan Digital Sky Survey je dnes nejdůležitějším přehlídkovým projektem. Optika hlavního dalekohledu je navržena pro viditelné pozorovací okno s přesahem do infračervené oblasti: 350÷930 nm. SDSS neustále systematicky mapuje jednu čtvrtinu nebe, měří polohu a jasnost více jak 100 miliónů objektů na obloze. Také určuje vzdálenost více jak 930 000 nejbližších galaxií v prostorovém objemu tisíckrát větším, než jsme znali před započetím projektu. SDSS zaznamenává vzdálenosti 120 000 kvazarů. Přehlídka probíhá od roku 2000 (SDSS-I, 2000-2005; SDSS-II, 2005-2008). Pokračování projektu probíhá od července 2008 s označením SDSS-III a je rozvrženo až do roku 2014.

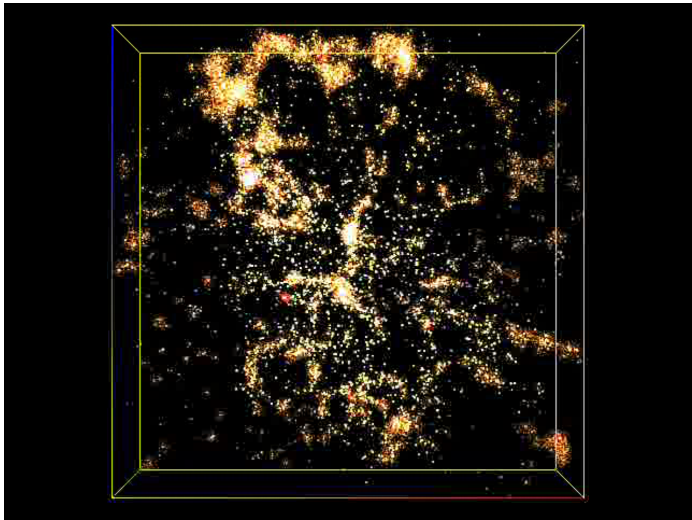
GALAKTICKÉ STĚNY



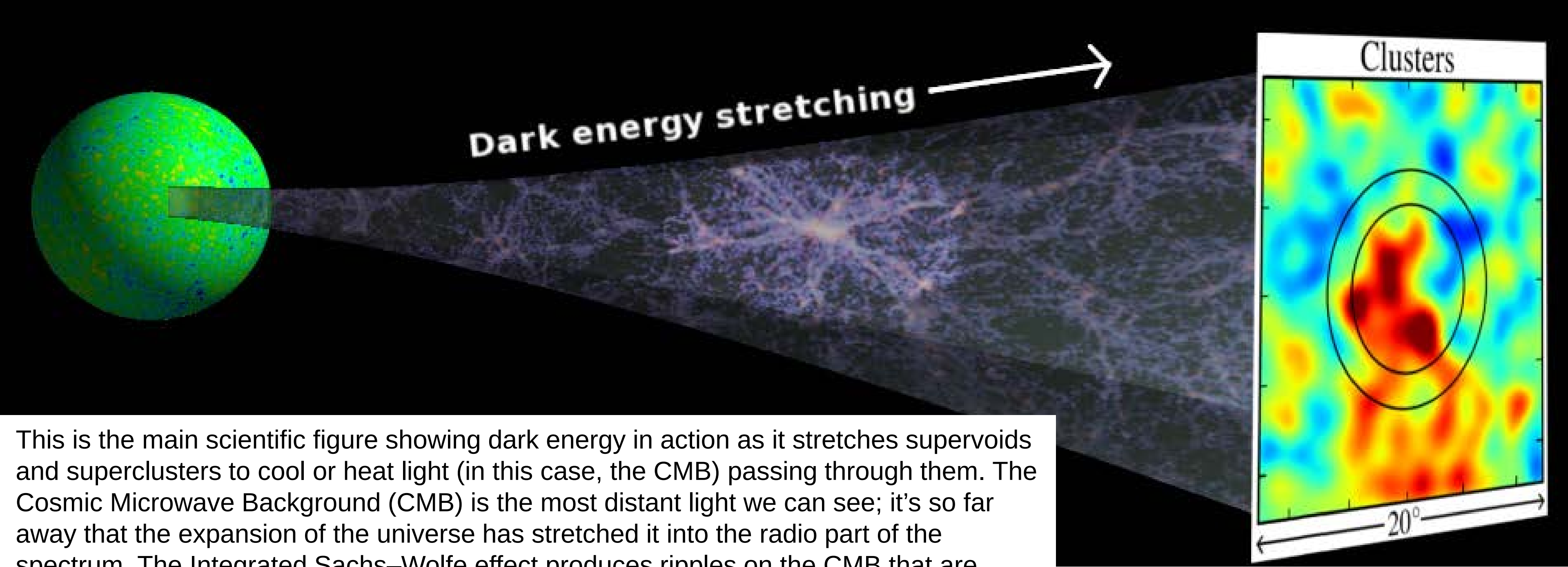




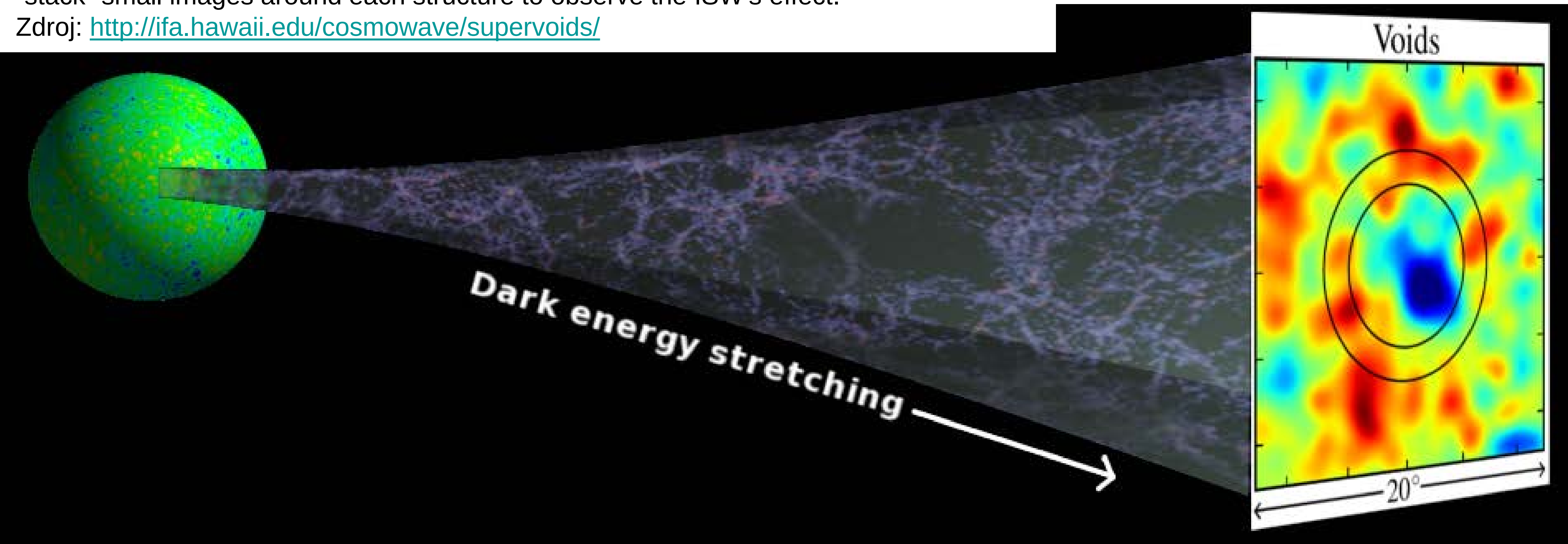
The Shapley Supercluster ($cz_\odot$~14,500km/s) is an extreme over-density of more than 20 Abell/ACO clusters within 25h^{-1} Mpc of the rich cluster A3558 which lies at l=312, b=31. Claimed to be the richest supercluster within 300 h-1Mpc (Zucca et al. 1993). By contrast the Hydra-Centaurus Supercluster/Great Attractor has only ~4 Abell/ACO clusters.



http://arxiv.org/abs/astro-ph/0402362

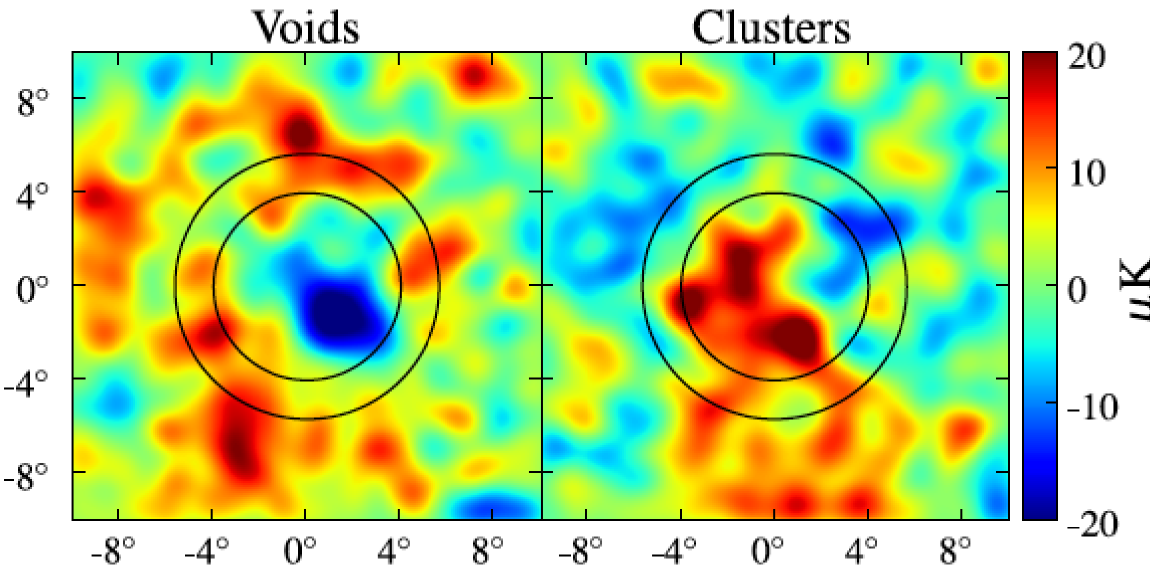


This is the main scientific figure showing dark energy in action as it stretches supervoids and superclusters to cool or heat light (in this case, the CMB) passing through them. The Cosmic Microwave Background (CMB) is the most distant light we can see; it's so far away that the expansion of the universe has stretched it into the radio part of the spectrum. The Integrated Sachs–Wolfe effect produces ripples on the CMB that are even smaller than the 1-part-in 10,000 ripples that the CMB has initially, so we had to "stack" small images around each structure to observe the ISW's effect.
Zdroj: http://ifa.hawaii.edu/cosmowave/supervoids/

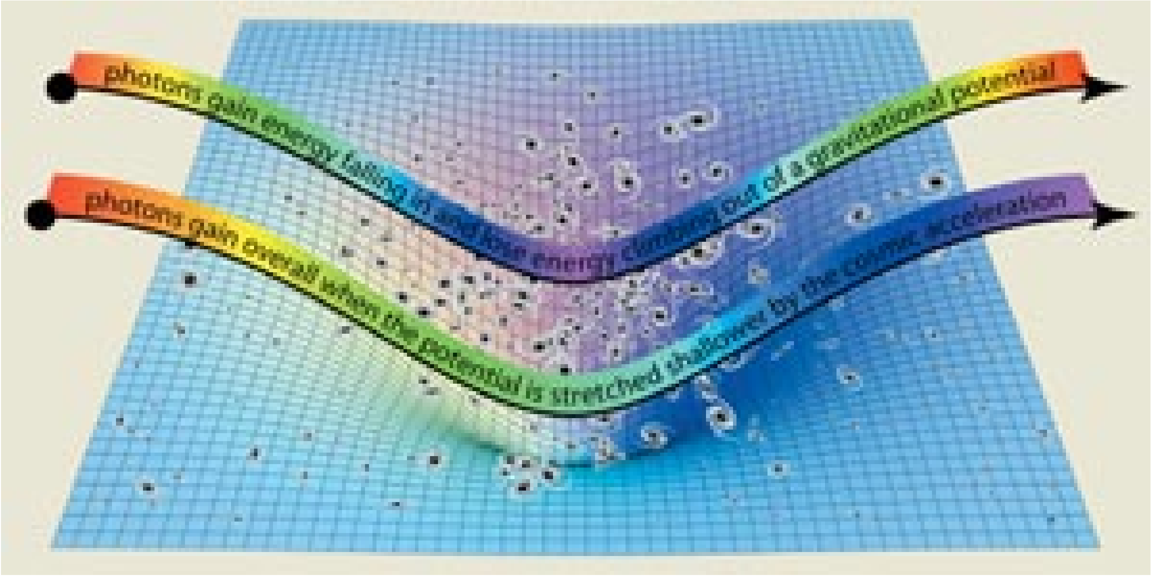


The Integrated Sachs-Wolfe Effect

A supercluster is a huge region of the Universe with relatively many galaxies; a supervoid is a huge region with relatively few. When light travels into a supercluster, it heats up, gaining energy as though it were rolling into a valley. When the light leaves the supercluster, it must give that energy back. But dark energy stretches and flattens the valley in the meantime, and lets the light keep some of the warmth it had in the supercluster. Similarly, light leaving supervoids gets a slight chill as a souvenir.

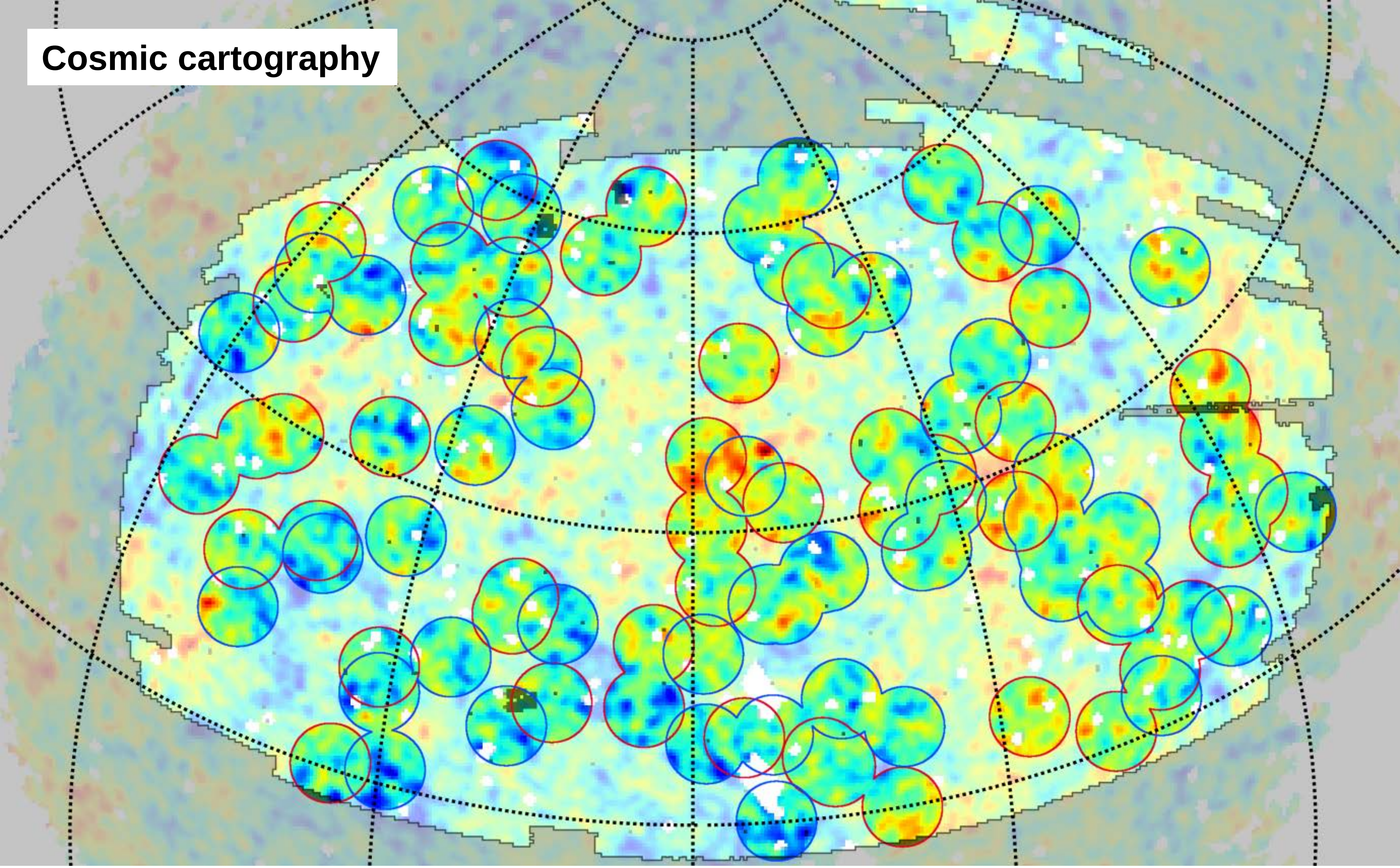


The movie at right shows how a supercluster leaves a slight warm imprint on a screen of light that passes through it. The screen starts out all the same color (i.e. temperature). Green is lukewarm; red is hot, or energetic; and blue is cold, or lacking in energy.



When the light in the middle of the screen goes into the cluster, it grows more energetic, i.e. hotter, since it is falling “down” into the cluster. When it climbs back out, it cools back down. However, you might notice that the depression in the rubber sheet is getting shallower with time; that’s because dark energy is stretching it out. Thus the light doesn’t have as far to “climb” on its way out as on its way in, and it retains a yellow, warm tint.

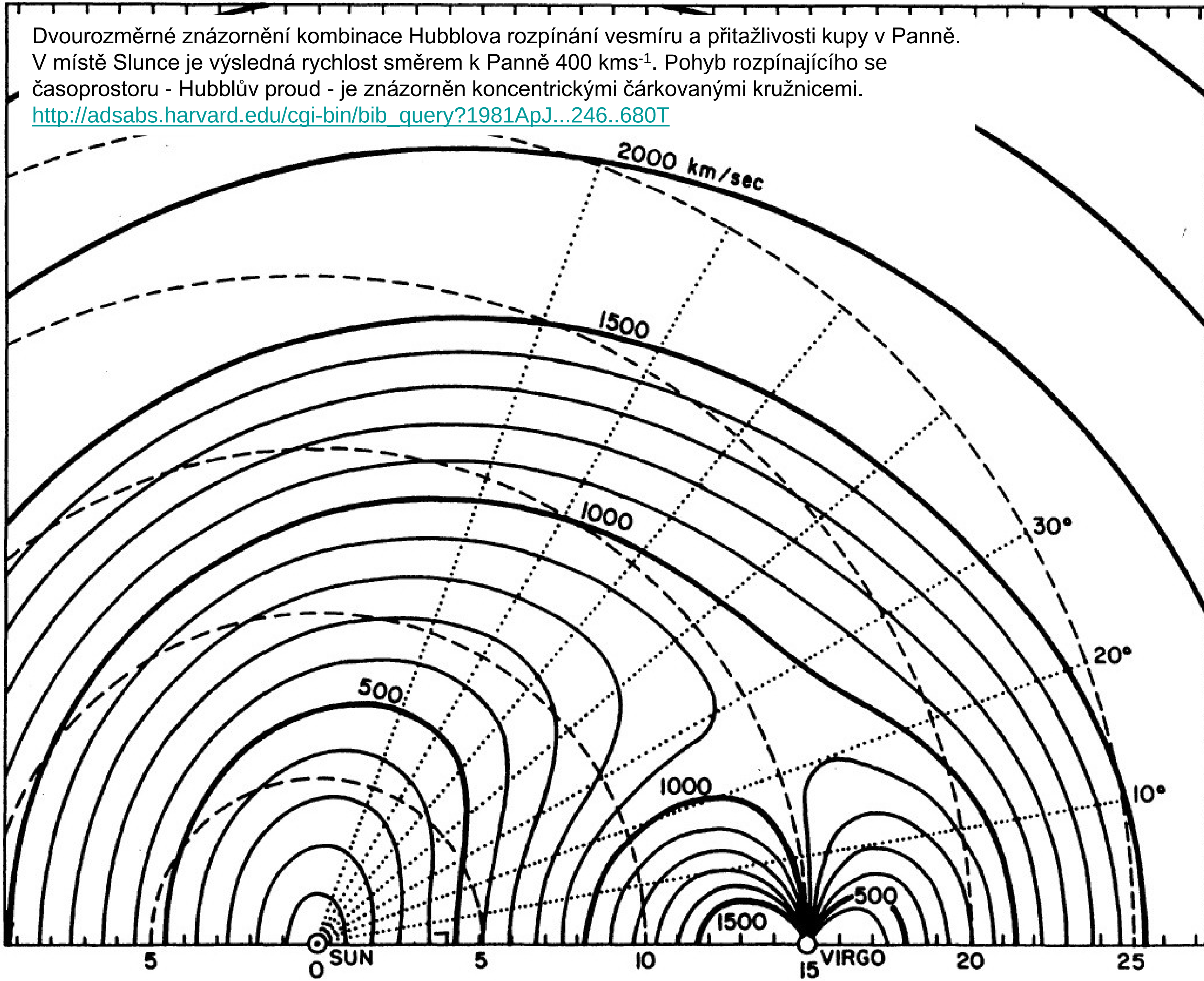
Zdroj: http://ifa.hawaii.edu/cosmowave/supervoids/



A map of the microwave sky over the SDSS area. The supervoids and superclusters used in our analysis are highlighted and outlined at a radius of 4°, blue for supervoids and red for superclusters. The compensated filter we use in our analysis approximately corrects for the large-angular-scale temperature variations that are visible across the map. The SDSS DR6 coverage footprint is outlined. Holes in the survey, e.g. due to bright stars, are displayed in black. Additionally, the WMAP Galactic foreground and point source mask is plotted (white holes). The disk of the Milky Way, which extends around the left and right border of the figure, is also masked. The map is in a Lambert azimuthal equal-area projection, centred at right ascension 180 and declination 35. The longitude and latitude lines are spaced at 30° intervals.

Zdroj: http://arxiv.org/abs/0805.2974

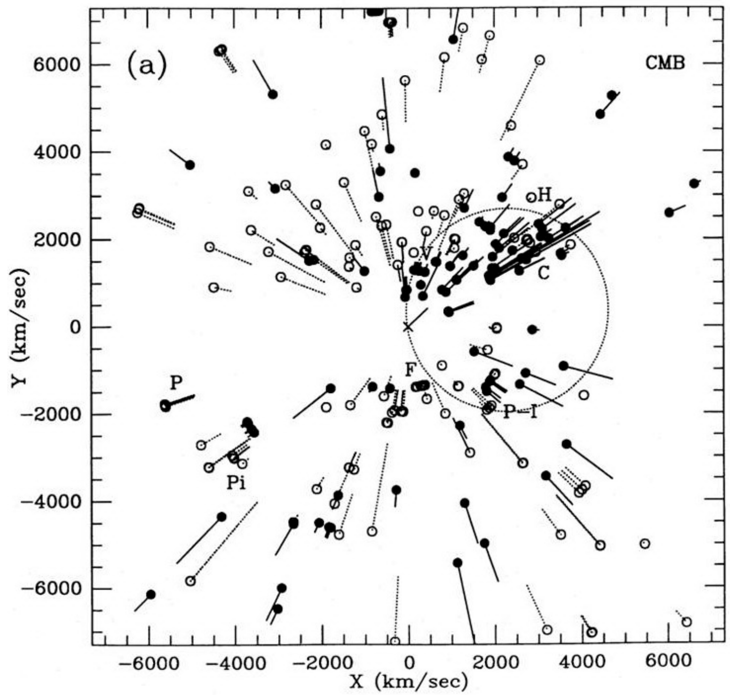
Dvourozměrné znázornění kombinace Hubblova rozpínání vesmíru a přitažlivosti kupy v Panně. V místě Slunce je výsledná rychlost směrem k Panně 400 kms-1. Pohyb rozpínajícího se časoprostoru - Hubblův proud - je znázorněn koncentrickými čárkovanými kružnicemi.
http://adsabs.harvard.edu/cgi-bin/bib_query?1981ApJ...246..680T

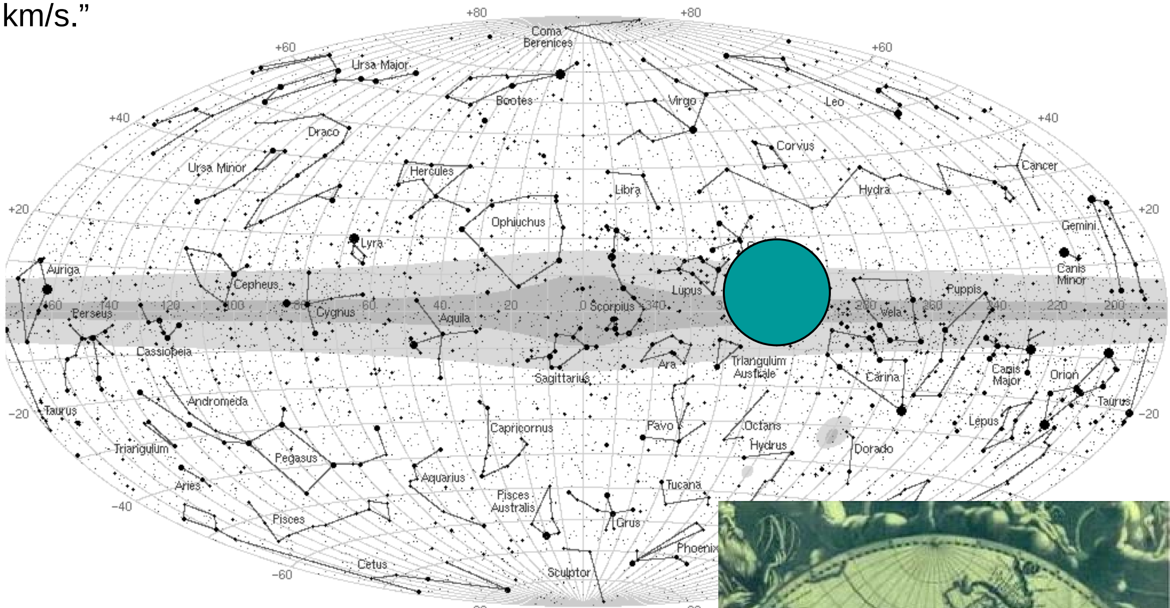


The Great Attractor (Lynden-Bell et al. 1988)

“The motions of elliptical galaxies … are best fitted by a flow towards a great attractor centred on l=307˚, b=9˚ at a distance of 4350 +/- 350 km/s.”

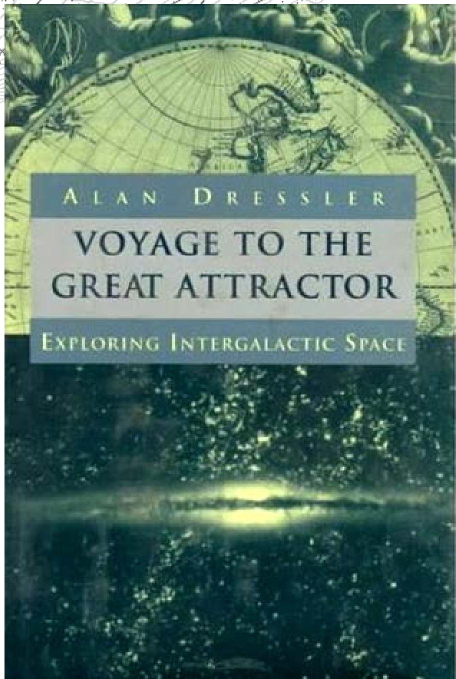
“The excess mass must be ~5.4 x 10^{16} M_{SUN}, comparable to the largest superclusters, in order to generate the streaming motion at the Sun of 570 +/- 60 km/s.”





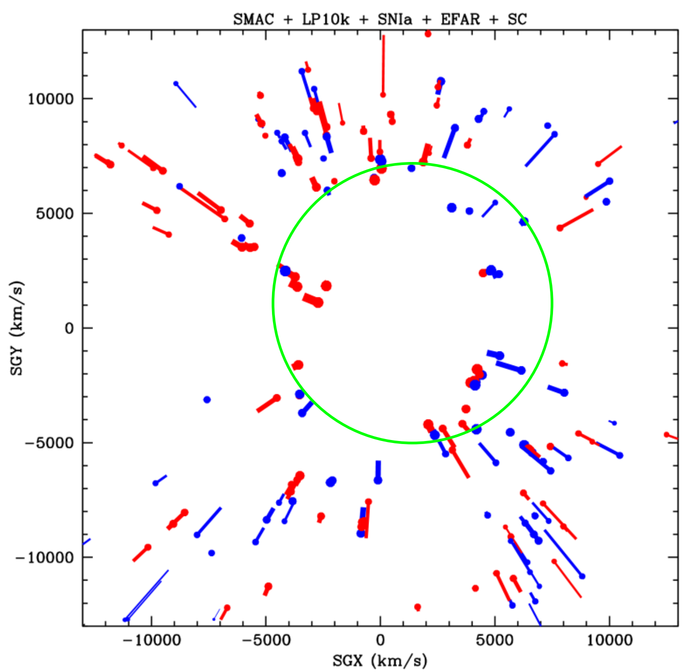
Seven Samurai 1987

Alan Dressler, Sandra Moore Faber, Donald Lynden-Bell, Roberto Terlevich, Roger Davies, Gary Wegner and David Burstein. Their results were so astounding they acquired the equally astounding nickname of „The Seven Samurai“



Lucey, Radburn-Smith & Hudson 2004

Bulk Flow: 340 +/- 80 km/s towards l=290, b=10
All surveys are consistent with this value
Consistent with ΛCDM

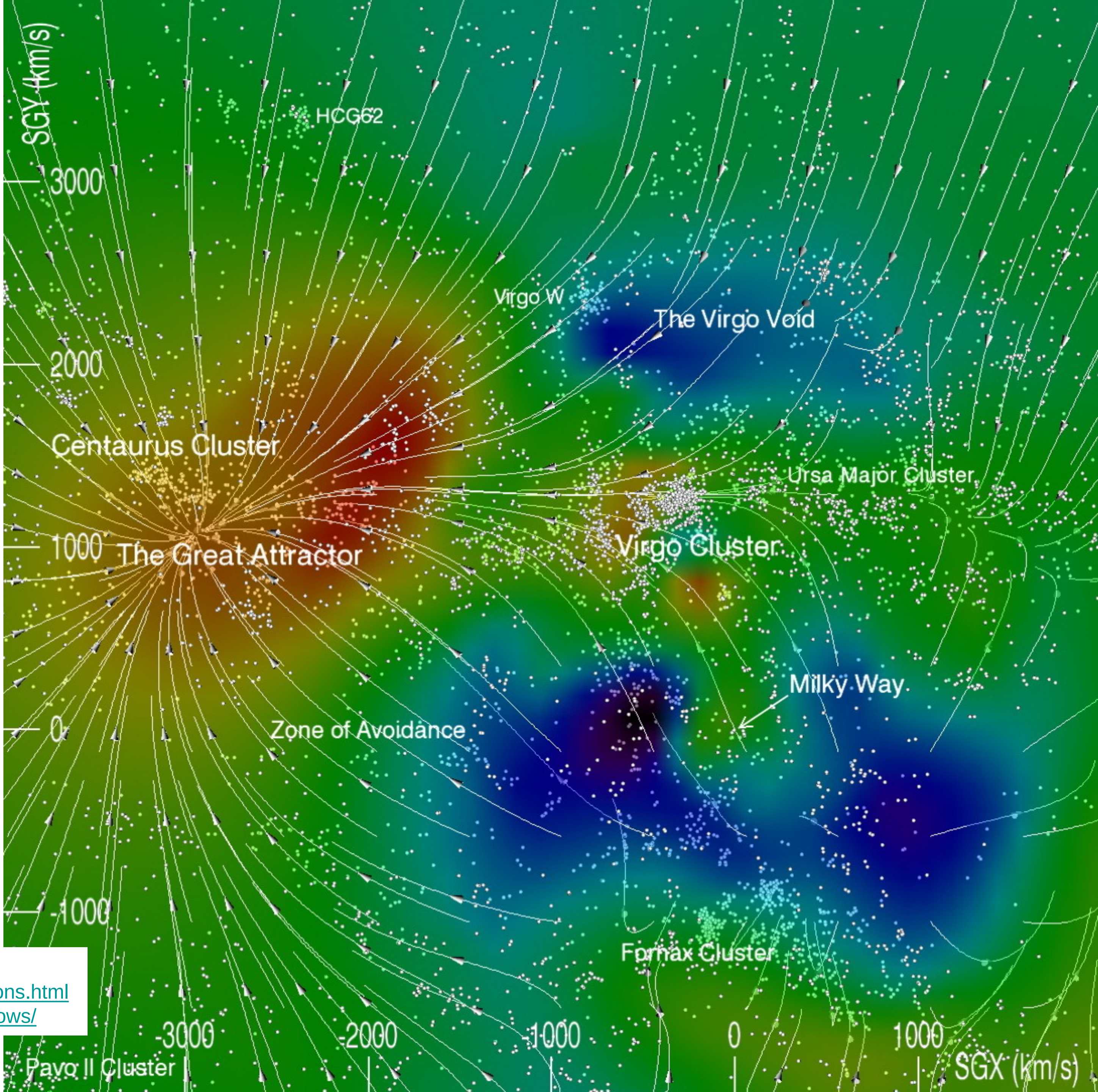


Cosmicflows-1 catalog

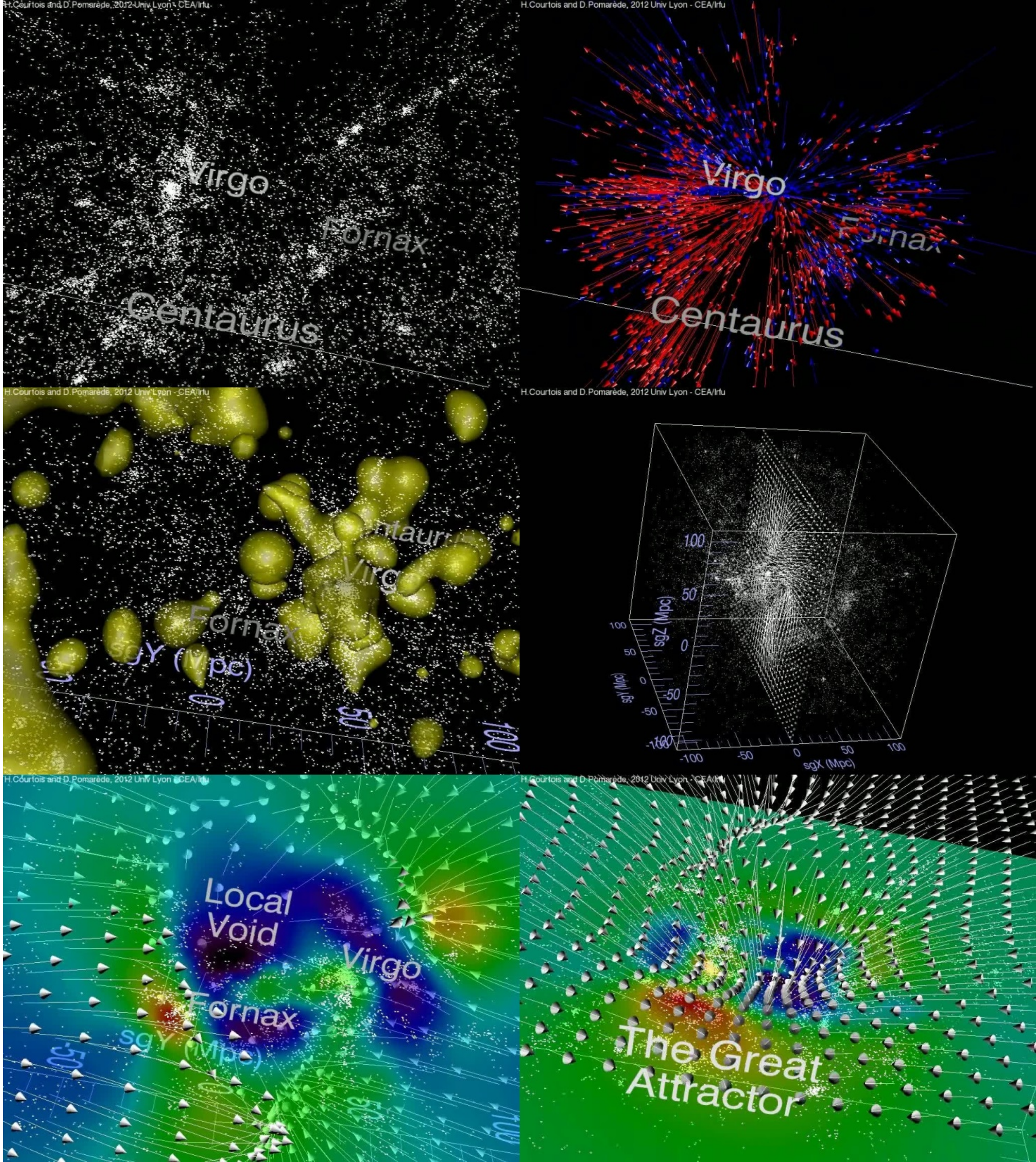
(*H. Courtois, D. Pomarède; SDvision*)

Červená značí vysokou koncentraci látky, modrá znázorňuje oblasti nízké hustoty. Hlavní vysoce husté oblasti jsou kupa Centaurus, Velký atraktor (vlevo uprostřed) a kupa v Panně (vpravo uprostřed).

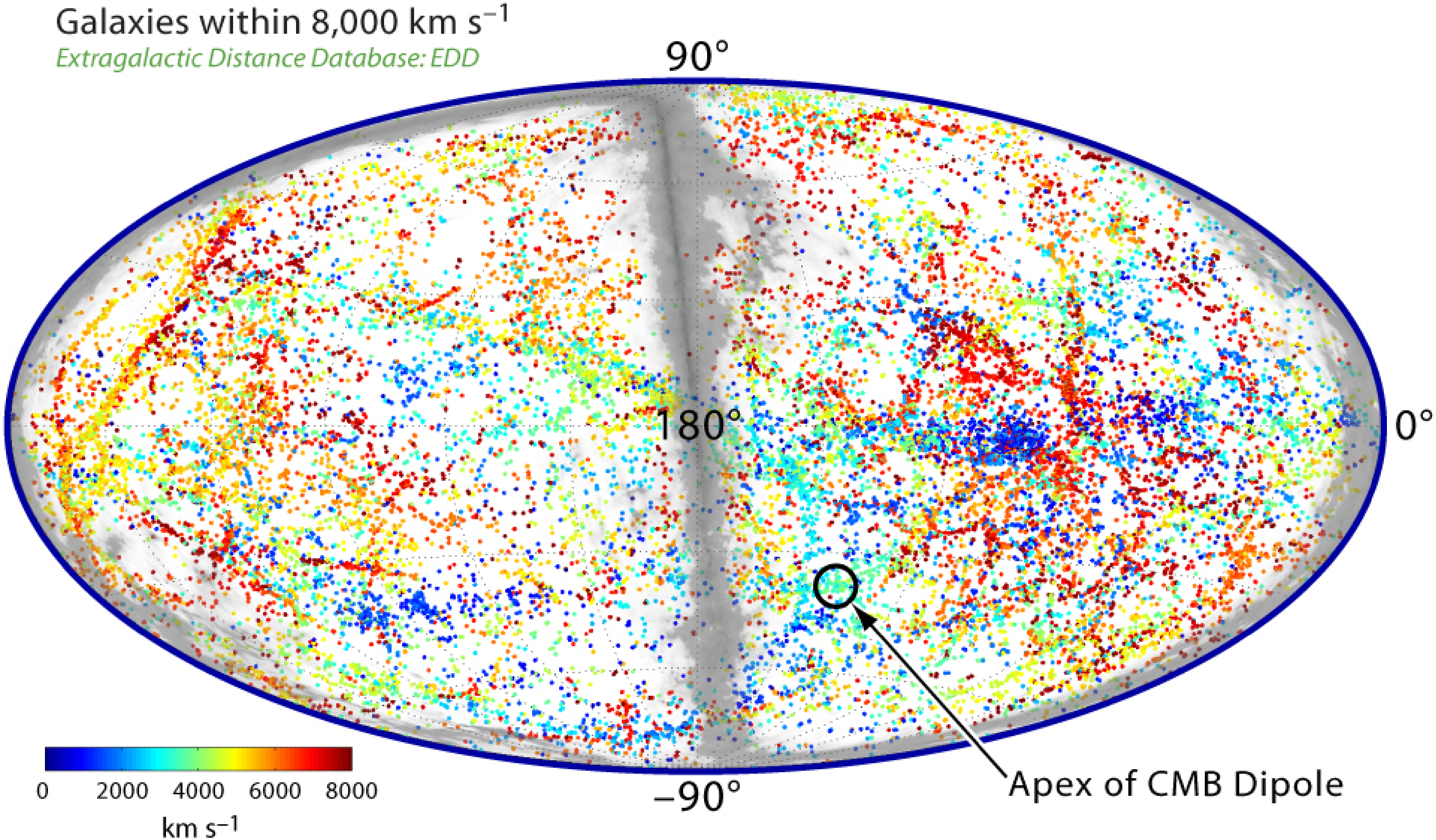
Galaxie čítá 10^{11} hmotností Slunce, Velký atraktor odpovídá gravitačně 10^{17} hmotností Slunce. Pohyb Galaxie činí ve směru k Velkému atraktoru 600 km/s.



Zdroje:
http://www.clues-project.org/observations.html
http://www.ipnl.in2p3.fr/projet/cosmicflows/



Comparison of the actual distribution of observed galaxies with the Wiener Filter reconstruction, 6:32 min
(H. Courtois, D. Pomarède; SDvision).
Zdroj: http://www.clues-project.org/misc/clues-obsmovies/observations/SDvision_CosmicFlows_LongScenario_dev004_xvid_q8.avi



The Cosmic Flows project has mapped visible and dark matter densities around our Milky Way galaxy out to a distance of 300 million light-years. The large-scale structure of the Universe is a complex web of clusters, filaments, and voids. Large voids—relatively empty spaces—are bounded by filaments that form superclusters of galaxies, the largest structures in the Universe. Our Milky Way galaxy lies in a supercluster of 100,000 galaxies.

Zdroj: http://irfu.cea.fr/cosmography