

What makes a supercluster?

August 26 2024, by Paul M. Sutter

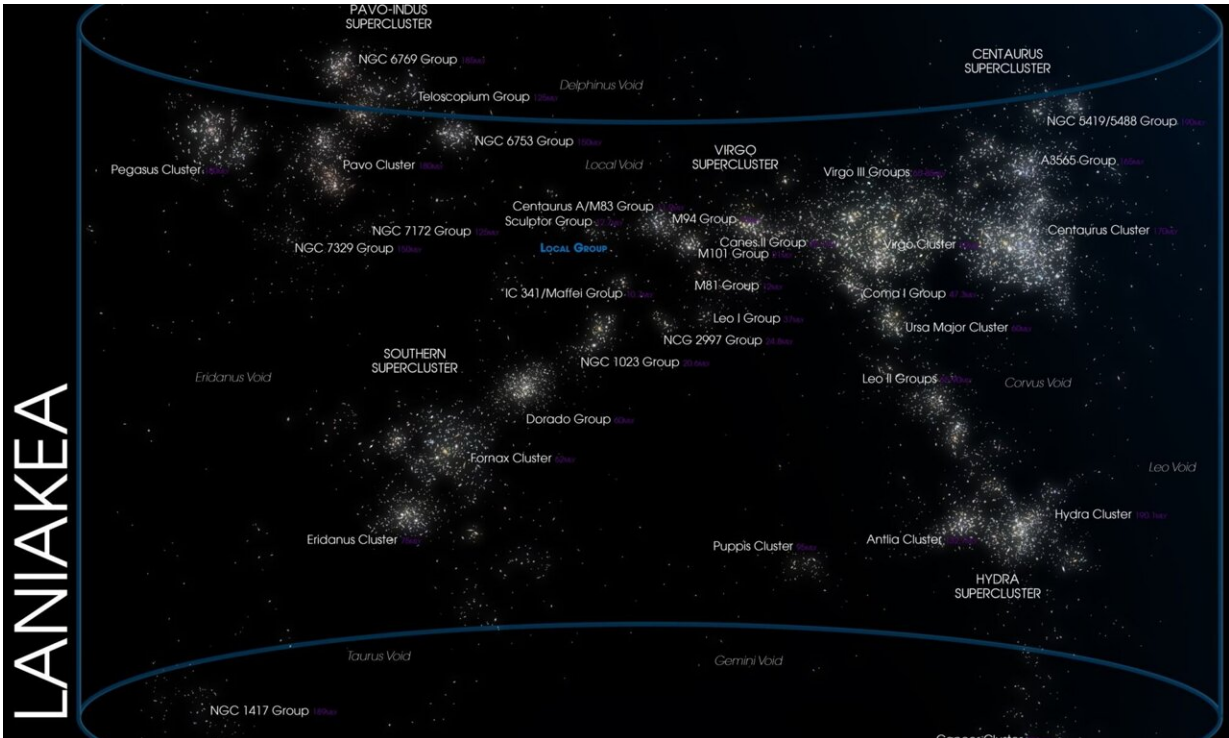


Illustration of the Laniakea Supercluster. Credit: Andrew Z. Colvin

By eye, it's impossible to pick out the exact boundaries of the superclusters, which are among the largest structures in the universe. But that's because they are not defined by their edges, but by the common motion of their components.

The Milky Way galaxy was long thought to be a member of the Virgo

supercluster, a complex, twisting branch containing more than 100 individual galaxy groups and clusters stretching for more than a hundred million light-years. Astronomers arrived at that definition through some of the earliest galaxy surveys that attempted to map the nearby portions of the universe.

Those early surveys were not entirely sophisticated. Astronomers could spot the [galaxies](#) scattered around, and also dense clumps of galaxies known as clusters. Ever since the 1950s, astronomers have debated if there were higher-order structures in the pattern of galaxies, wondering if "super-galaxies" (or superclusters) existed.

Once astronomers began to map deep into the universe, however, the cosmic web could not be ignored. While some galaxies found their homes in the clusters, most inhabited long, thin filaments and broad walls. This cosmic web was defined by the voids, the vast regions of almost-nothing that dominate the volume of the universe.

The largest portions of the [cosmic web](#) are the superclusters. But unlike the clusters, they are not gravitationally bound. That means that the member galaxies in a supercluster have not yet finished their building project. The superclusters are still in the process of forming. This fact makes it difficult to pick out exactly what a supercluster is.

Recently astronomers have turned to dynamical definitions of a supercluster. This means that they don't just consider the position in space of a particular galaxy, but also its movement. Since superclusters are in the process of continual construction, this method looks at what galaxies are trying to build.

This method allows astronomers to distinguish one supercluster from another, and that's how we've recognized that the Virgo supercluster is just one individual branch of a much larger structure known as [Laniakea](#),

which contains an astounding 100,000 galaxies. And that is our home in the universe.

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