Prelude to spring

People enjoy festive customs, holiday fun during year's coldest period LIFE, PAGE 17

Country trims holdings of US Treasury bonds

BUSINESS, PAGE 13

Bowing out

New Zealand's prime minister announces her resignation

WORLD, PAGE 11

CHINA DAILY

香港版
HONG KONG

FRIDAY, January 20, 2023

中国日报

www.chinadailyhk.com HK $10

Chinese scientists find mass distribution of new stars variable

By ZHANG ZHIHAO
zhangzhihao@chinadailyhk.com.cn

Chinese astronomers have made a remarkable discovery that challenges the basic understanding of large-scale star formation that may have wide applications in astrophysics, according to a study published in the journal Nature on Thursday.

They discovered that time and metal content in a stellar cradle can affect the variation in the mass of newborn stars.

The formation of stars doesn't sound very complicated — a big molecular cloud of atoms gathers into a spherical shape under its own gravity to a point where nuclear fusion takes place and the star starts to glow.

In reality, stars do not form alone, but in stellar nurseries which create stars of different masses, from tiny red dwarfs to massive blue giants. To study star population, scientists use a concept known as initial mass function to estimate how many small and large stars are created in these stellar nurseries.

The concept describes the distribution of stellar masses in a large cluster of stars, and is one of the foundational empirical tools for explaining why high-mass stars are so much rarer than low-mass ones.

Astrophysicists often use initial mass function in their research because they believe it applies to all clusters of stars. It is so universal that astronomy textbooks have been teaching it for decades.

But in recent years, scientists have begun to suspect this cornerstone of stellar theory is not as solid as it seems, and that initial mass function may change depending on other factors, such as metallicity — the content of elements that are heavier than helium — or the temperatures of the gas clouds in which stars are born.

To put the debate to rest, Chinese astronomers used the Large Sky Area Multi-Object Fiber Spectroscopic Telescope, also known as LAMOST, and the Gaia satellite of the European Space Agency, to analyze over 93,000 red dwarfs, which are small, slow-burning stars that can last for tens of billions and even trillions of years.

They discovered that more high-mass stars and fewer low-mass stars were forming in the early ages of the universe than the initial mass function predicted. In addition, the higher the metallicity of the stellar cradle, the more low-mass stars are formed.

Liu Chao, a researcher from the National Astronomical Observatories of the Chinese Academy of Sciences, said that the new discovery shows that the mass distribution of newly born stars is far more complex than previously anticipated.

Pavel Kroupa, a professor at the University of Bonn in Germany, said the results are very important to addressing the universality of stellar initial mass function, and allow researchers an in-depth understanding of the possible shifts in stellar populations that formed at different times and under different conditions.