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# Are We Approaching a New Influenza Pandemic?

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**Abstract**

Over the past several months influenza activity has continued to increase in the temperate zones of the northern hemisphere and has led to a concern over global health and the impending prospect of another major pandemic. Based on a range of available evidence we argue that the current influenza situation might be related to the on-going La Niña phenomenon accompanied by increased precipitation patterns in the Pacific. The four most recent human influenza pandemics (1918, 1957, 1968, and 2009) were preceded by La Niña conditions in the equatorial Pacific and almost all influenza pandemics in history fall within ± 1 year of sunspot extreme. Sunspot activity will reach its minimum in 2019. Therefore, a new influenza pandemic may well be imminent now, one hundred years after the 1918-1919 pandemic. It will therefore be prudent and timely to strengthen worldwide surveillance strategies and to prepare ourselves for a future emergency.

**Keywords:** Influenza; Flu season; Pandemic risk; Cosmic rays

## Short Communication

Influenza activity has continued to increase in the temperate zones of the northern hemisphere from the end of 2017 to the beginning of 2018 and has led to a significant concern over global health. Some countries have reported levels of hospitalization and ICU admissions reaching or exceeding the peak levels associated with previous influenza seasons. According to the US Centers for Disease Control and Prevention (CDC), flu activity is now widespread throughout most of the United States, and the number of states experiencing exceptionally "high" influenza activity increased from 32 states (plus New York City and Puerto Rico) to 39 states (plus New York City and Puerto Rico).

It is of interest to explore some of the mechanisms that might be responsible for the sudden surge of influenza cases. There are indications to suggest that Influenza activity tends to be significantly higher during times when La Niña conditions prevail [1,2]. If so it might be argued that the current influenza situation might be related to the on-going La Niña (opposite of El Niño) phenomenon in the Pacific [3] which could well serve as a driver of new viral pandemics.

The six pandemics on record since 1889 all emerged in the Northern Hemisphere following the "normal" flu season, suggesting that some other forces may predictably constrain pandemic risk [4]. Furthermore, a recent study has shown that the four most recent human influenza pandemics (1918, 1957, 1968, and 2009) were preceded by La Niña conditions in the equatorial Pacific [5]. Some extreme climatic events such as extremely cold weather caused by La Niña conditions can alter the migration route, stopover time, fitness, and interspecies mixing of migratory birds and arguably affect their intermingling with domestic animals, within the constraints of a purely Earth-bound theory of biological evolution and influenza modeling [6].

In a recent review we have shown, however, that a purely Earth-bound theory of biology may be deeply flawed [6]. Perhaps, more importantly, atmospheric and indeed space weather conditions could promote or enhance the role of extraterrestrial influences, including the arrival of external virions [7]. In particular the role of cosmic rays could be important in providing new pathways for the arrival of new virions, as well as the modification of already circulating viruses [6-9].

The connection between sunspot activity and certain aspects of global climate is in general well attested in the literature. At a minor level a correlation it has been found that fluctuations of solar cycle length and mean atmospheric temperature are possibly linked. A more significant effect is found in the Maunder minimum when during an exceptionally cold interlude (mini-ice age) between 1645-1715 there was very little sunspot activity.

It is possibly no coincidence that almost all influenza pandemics in history fall within ± 1 year of sunspot extreme (maxima and minima) [8], and we should note with a sense of caution that sunspot activity is indeed predicted to reach a record low minimum in 2019 [9]. According to the record of Sunspot Index and Long-term Solar Observations of World Data Center, sunspot activity will reach its low minimum in 2019 (Figure 1).

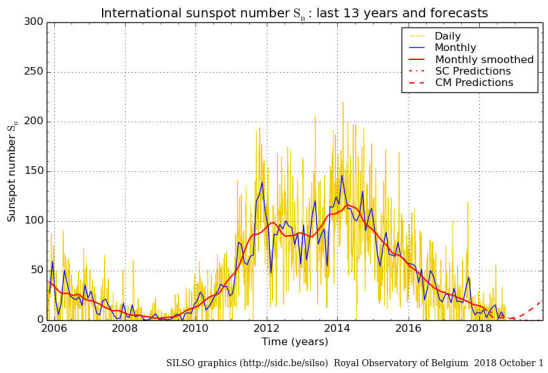


**Figure 1:** Predictions of the monthly smoothed sunspot number. Daily sunspot number (yellow), monthly mean sunspot number (blue), smoothed monthly sunspot number (red) for the last 13 years and 12 months ahead predictions of the monthly smoothed sunspot number: SC (red dots) : prediction method based on an interpolation of Wald Meier's standard curves; It is only based on the sunspot number series. CM (red dashes): method (from K. Denkmayr and P. Cugnon) combining a regression technique applied to the sunspot number series with the as geomagnetic index used as a precursor (improved predictions during the minimum phase between solar cycles).

New data released by the European Space Agency (ESA) further reveals that the strength of the geomagnetic field is systematically weakening by around 5% every ten years, which is nearly ten times faster than previous estimates [10]. Furthermore, it is weakening faster in some places more than in others. For example, the South Atlantic Anomaly (SAA) is a large depression of the Earth's magnetic field intensity characterized by values of geomagnetic field intensity around 30% lower than that expected for those latitudes, and this covers a large area in the South Atlantic Ocean and South America. According to Swarm satellite monitoring results, SAA has moved steadily westward and weakened further by about 2%. Cosmic rays, particularly galactic cosmic rays, can reach their maximum intensity when the earth's magnetic field is declining dramatically and when the sun is least active. Low solar activity can also give rise to exceptionally cold winters in northern Europe and the United States [11]. The superposition of all these conditions and circumstances that are now well attested can promote epidemics involving a wide range of influenza subtypes. Influenza pandemics can emerge via genomic re-assortment between circulating human and animal strains and also almost certainly with the introduction of extrinsic viral components [6,7].

Abnormal climate change patterns caused by the combination of a deep solar minimum and La Niña conditions can bring divergent influenza subtypes together in some parts of the world. In addition to the possibility of externally introduced virions this could facilitate the re-assortment of circulating influenza virions through simultaneous multiple infection of individual hosts, thus resulting in the emergence of an antigenic ally novel strain capable of causing a devastating worldwide pandemic. In view of the geographic localization of the environmental effects we have discussed the area around South America is very likely to be a possible starting point of the next influenza pandemic.

In summary, there are powerful indicators to suggest that a new influenza pandemic is fast approaching, almost 100 years after the devastating historic pandemic of 1918/1919. It will thus be prudent and timely to strengthen worldwide vigilance and surveillance strategies including space weather and stratospheric monitoring and to prepare ourselves for a future emergency.

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