

## **Is the Sun making our winters colder?**

**Ever since the Vikings first sailed over the Atlantic Ocean, people living in the North Atlantic area, have noticed periods of colder and warmer winters. This is no coincidence. It is a result of an atmospheric circulation phenomenon known as the North Atlantic Oscillation, or the NAO. This circulation pattern is known to influence weather from the eastern coast of North America all the way to Siberia.**

Two pressure areas are often used when describing the NAO, the Icelandic low-and Azores high pressure systems. The difference in sea level pressure between these two areas produce a pressure gradient. Because of this pressure gradient westerly winds over the Atlantic are generated. The NAO is often described as being in an either positive or negative state indicating how well developed the high- and low pressure areas are. With a strongly developed Icelandic low and Azores high, the pressure gradient grows bigger, resulting in strong westerly winds over the North Atlantic. This is known as a positive NAO phase. During the negative NAO phase the pressure systems are less well developed and the pressure gradient is smaller, hence the westerly winds gets weaker. The positive and negative phases of the North Atlantic Oscillation are also associated with certain patterns of precipitation and temperatures. This affects among other things agriculture and water and energy supplies for people living in the Atlantic area. It is therefore of great value to understand which processes are causing the NAO to vary. Since the end of the 20<sup>th</sup> century research on the forcing mechanisms behind the NAO has increased. Suggestions have been made that the NAO is forced by changes in sea surface temperatures, volcanic eruptions and sea ice.

### **Is the sun causing changes in the North Atlantic Oscillation?**

Another debated possible forcing factor on the NAO is variations in solar activity. Several studies have reported correlations between variations in the NAO and variations in solar activity. This is shown in records from the later part of the 20<sup>th</sup> century when periods of high solar activity appear to be related to a positive NAO. This relationship, however, was not seen in the beginning of the century when positive phases of the NAO did not significantly correlate with periods of high solar activity. Some studies propose that low solar activity may cause “blockings” to occur. These features are persistent high pressure systems interrupting the path of the westerly winds and tend to be more common during negative NAO phases. One climatic effect of these weather patterns is seen in cold winters over northern Europe. Another possible effect of solar irradiance variations is that stratospheric waves caused by heating of the stratosphere may be communicated down to the troposphere resulting in stronger westerly winds over the North Atlantic and a positive NAO during high solar activity. Safe to say is that the last word has not yet been spoken. With better data generated future studies will keep investigating, trying to solve the mysteries of the North Atlantic Oscillation and improve our understanding of the climate system.