

Lightning Monitoring Tool in the Netherlands

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Introduction

Monitoring lightning activity above/on the Dutch forecast area is one of a set of primary warning-tasks of KNMI's forecast office. KNMI makes use of a criteria-based warning system to inform and warn the public which is primarily focused on the number of lightning strikes within a 50x50 km area.

According to the criteria for issuing of warnings, the threshold of 500 lightning strikes within 5 minutes corresponds to dangerous impact on society. To monitor this criterion in an efficient way the 'Lightning Monitoring Tool' has been developed.

Lightning detection

The lightning tool makes use of KNMI's TOTAL lightning detection system, the SAFIR/FLITS detection system which is able to discriminate both Cloud to Cloud (CC) and Cloud to Ground (CG) by using different localisation techniques. SAFIR/FLITS makes use of a high frequent Direction Finding method (DF) based on interferometry and a low frequent Time Of Arrival method (TOA). The network consists of 7 stations and is being operated in a cooperation between KNMI and the Belgium KMI.

Operational use

An operational meteorologist needs to act quickly, has different customers to respond to and multiple

products to monitor, so products need to be efficient and effective.

The lightning tool has been created with user-friendliness and self explanatory interface in mind to supply the operational meteorologist with a quick and easy to understand interface to monitor the development and severity of lightning activity during thunderstorms and at the same time monitor the lightning criteria matching the warning-system.

Interface

The tool is web-based and accessible through the local network in the forecasting office. Navigating is done by using the time-bar on the far left of the tool. By moving the mouse the images in the tool are displayed corresponding to the selected step on the time-bar. Below a description of the interface is being given.

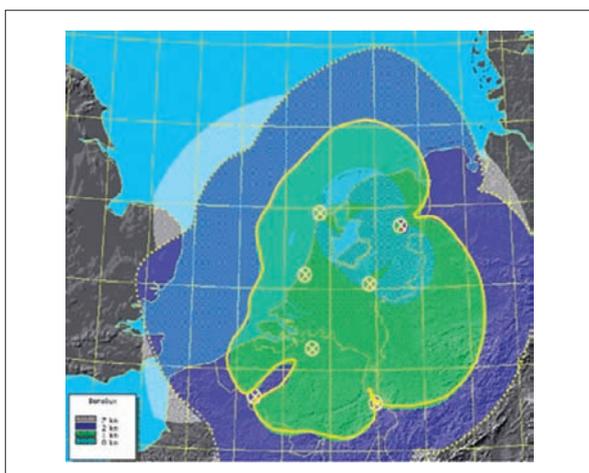
Main screen

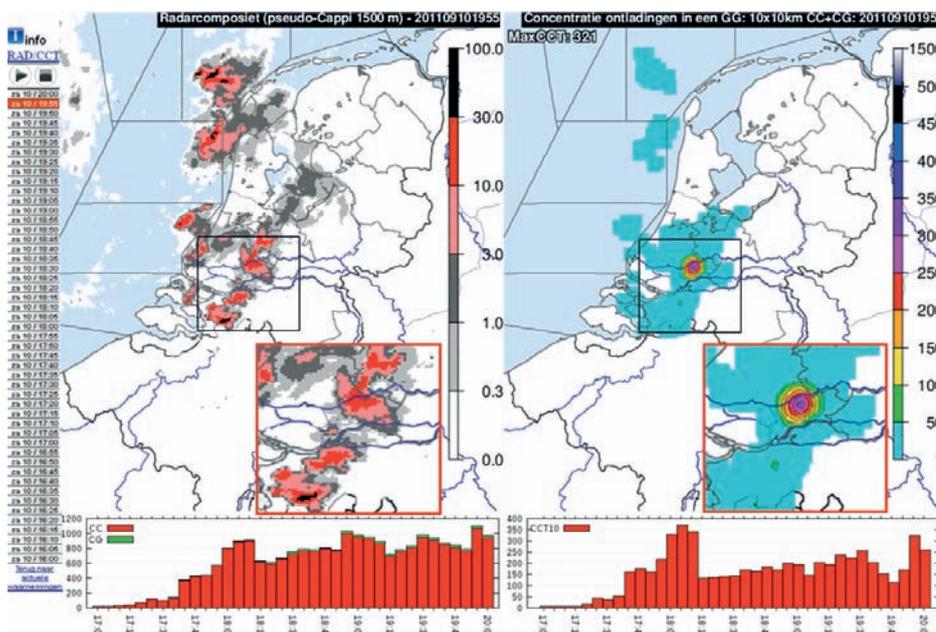
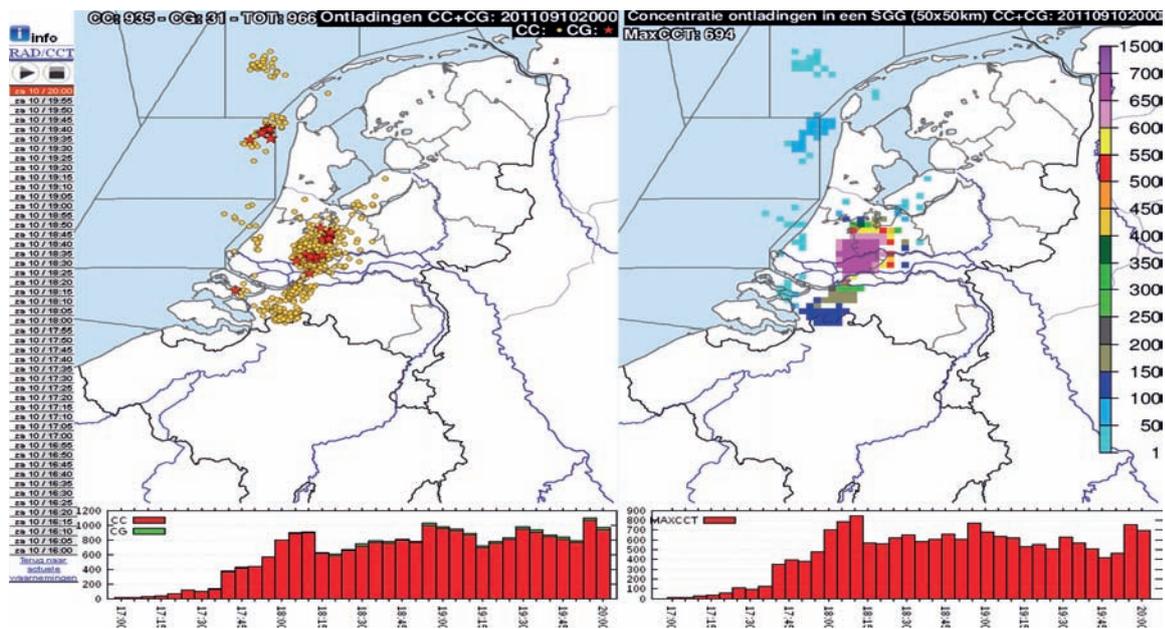
Left-hand side – main screen

To determine whether the lightning strikes are Cloud to Cloud (CC) or Cloud to Ground (CG) and therefore the effects on the ground solely by lightning-strikes (of course there are other phenomena occurring during thunderstorms that have impact on society), the displayed strikes are distinguished by a different symbol and color. Furthermore the accompanying graphs are displayed at the bottom of the tool in which the distribution, trend and total amount of lightning can be read.

Right-hand side – main screen

To monitor the lightning criteria explained previously, a display of the total number of lightning-strikes (both CC and CG) within a pre-defined box of 50x50 km is presented. A colour scale on the right gives insight in the total amount of lightning measured by the detection network. At the bottom of the tool the maximum concentration within the Dutch forecast area is displayed as sort of a first proxy for the trend of the maximum concentration within a 50x50 km box during lightning-events.





Secondary screen

Left-hand side – secondary screen

To compare lightning activity being measured by the lightning detection network with radar, a second screen is added to the tool. The image on the left hand side of the tool gives insight in the radar-imagery at pCappi level of 1500 m.

Right-hand side – secondary screen

Because the highest reflection on radar does not always correspond to the greatest lightning activity in a thunderstorm, the concentration of lightning-strikes within a 10x10 km area is also plotted as a concentration. The image above clearly underlines the

former statement. The resulting image on the right-hand side gives insight in the greatest activity of individual storms/cells and their updrafts. In this way, the forecaster can pinpoint where the most dangerous parts of the thunderstorm(s) is/are resulting in a more detailed forecast when needed. The ‘normal’ 50x50 km criteria is too broad to give insight into the individual updrafts and related lightning-activity and their impact on the smaller scale. Also the output on which the lightning-strikes are plotted don’t give a detailed insight into the thunderstorm strength. Therefore this smaller scale view of the lightning-activity gives a handy insight that is being used to communicate impact related forecasts to different parties when needed.