NEW CAPABILITIES OF THE EUROPEAN SEVERE WEATHER DATABASE

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I. INTRODUCTION

The European Severe Weather Database (ESWD) is a database of severe weather reports for Europe and the Mediterranean Region (Dotzek et al., 2009). The database, which currently contains about 25,000 reports, has recently undergone several enhancements, both of a fundamental and of a technical nature. These enhancements both accommodate the cooperation of ESSL with partner organizations, and an improved quality control of the data.

The new ESWD version 3 has been developed by ESSL, and this upgrade was partly funded by the German Weather Service (DWD). Interaction with the database may take place through three interfaces, each of which can be customized.

The first interface is the Internet website, available at www.eswd.eu (Fig. 1). For different user groups, accounts with different options and privileges can be created. The Internet interface allows users to perform mutations (submit, edit, delete), to query the database, and download data in several formats, given that the user's has been given these permissions. The data formats are

- ESWD 1.40 format (ESSL, 2006; Groenemeijer, 2004)
- ESWD 1.40-csv format (ESSL, 2009)
- an HTML table
- a simple graphic map

The first two are UTF-8 encoded human-readable text.

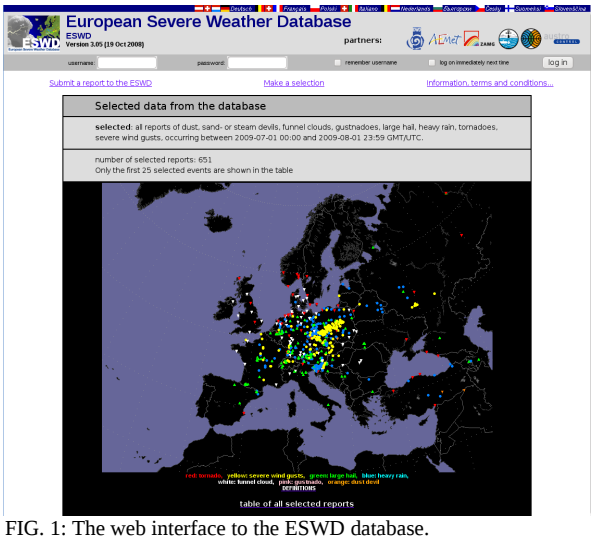

FIG. 1: The web interface to the ESWD database.

The second interface is secure ftp-transfer of csv-formatted data. This (more complex) solution has been implemented for the German Weather Service (DWD). Benefits are that the DWD can combine the data in new ways with other datasets that they own, and can edit the German subset of DWD data on their system, rather than having to log in to an external system.

A third way of accessing the ESWD is through the upload of data in the ESWD 1.40 format over passord-secured web-CGI. This upload feature was developed as part of a project called RegioExAKT in collaboration with Skywarn Germany, one of ESSL's partners. Their system transfers SMS messages from certified storm spotters who have observed a severe weather event to a central computer. The interface with the ESWD allows these reports to appear in the ESWD, and thereby on the Internet, in near-real time.

II. ESWD PARTNERS

Partners of the ESWD database can be grouped into four categories.

1. national (hydro-)meteorological institutes (NHMSs) and the ESSL
2. voluntary observer networks (VONs), using an internal quality control mechanism (such as spotter certification)
3. general public or individual observers

The ESWD currently has partners in each of those groups. Current NHMS partners in the ESWD project are the respective weather services of Austria, Bulgaria, Finland, Germany and Spain. Current VONs include Skywarn Germany, Skywarn Poland, Skywarn Slovenia, Skywarn CzechoSlovak, Keraunos (France), Skywarn Austria.

NHMSs and VONs each have specific roles within the ESWD network, that are outlined below.

III. QUALITY CONTROL

With the new version of the ESWD in October 2008, a quadrinomial classification describing the state of quality control of reports, has come into use. It was developed in response to problems with the former system that only differentiated between two quality levels. That system proved to be too coarse in practice: many reports that could not be fully verified could not be assigned the higher quality level, even when, for example, photographs supporting the report were available.

The new classification differentiates between the following levels:

- as received, **QC0**
- plausibility checked, **QC0+**
- confirmed by reliable sources, **QC1**
- fully verified, **QC2**

Severe weather reports can enter the ESWD from the three different groups of partners. Each of these groups has permission to perform quality control up to a certain level.

Data originating from the “general public” will automatically be assigned the lowest quality level, QC0, or

"as received". This means that no quality control has been performed. Data of this quality is in principle not suitable for scientific use. Hence it is very important that the quality level of such data be upgraded as soon as possible. Ideally after an severe weather episode, all QC0 reports either should be raised to QC0+ or higher status, or be deleted within a few days to weeks.

The VONs, NHMSs and the ESWD management at ESSL have the possibility filter out implausible reports and upgrade the quality level of the remaining reports to QC0+. In practice, they do that by logging on the database with their customized account that will enable them to perform such changes. Naturally, this is just an intermediate step, as QC0+ reports still have not undergone a serious effort to verify their quality. Needless to say, reports that originate from a partner organization, will skip this step, and immediately enter the database with QC0+ or higher status.

NHMSs and the ESSL, and VONs that have passed an initial trial period, can perform the next step of verification to QC1. Reports that are confirmed by *reliable sources* may be assigned the QC1 status. For example, QC1 can be selected when photo and/or video material is available with a trustworthy specification of location and time, or when printed media feature detailed reports that quote and name eyewitnesses. Voluntary observers (storm spotters) that operate within a network with an internal quality control procedure also qualify as reliable sources. In an QC1 report, some details may be missing or uncertain.

QC2 is reserved for the reports that have been fully verified. These data should be complete and correct. This status can only be given by the NHMS in the respective country, and by ESSL. In case of differing assessments of ESSL and the NHMS regarding the details of an individual report, the quality level QC2 will not be assigned.

IV. DATA CONTAINED IN THE DATABASE

The number of events contained in the database currently comprises almost 25,000 reports and gradually increases. Fig. 2 shows that the bulk of reports originate from the period 2006-present, i.e. after the ESSL was funded and commenced the management of the database.

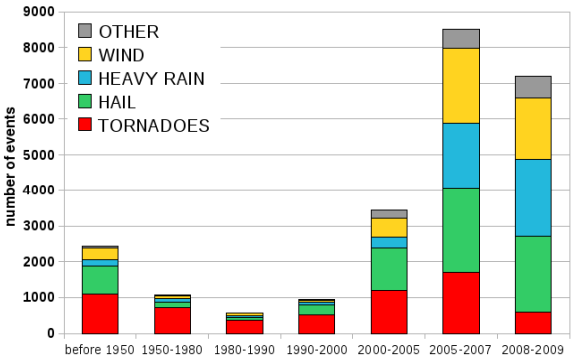

FIG. 2: Distribution of event types over the years.

Four event types form the lion's share of the reports, to wit wind, heavy rain, hail and tornadoes. There are some tendencies of the relative event type frequency through the years. From Fig. 2. it can be seen that the number of reports of heavy precipitation and wind gusts has increased strongly since the year 2000, and that older data is dominated by tornado and large hail reports.

Fig 3. shows a portion of the area covered by ESWD, giving an impression of the distribution of events. It can be seen that parts of central Europe has a very high coverage of events, but that areas like Romania, Bulgaria, Finland, central Russia and Greece also see a relatively high coverage.

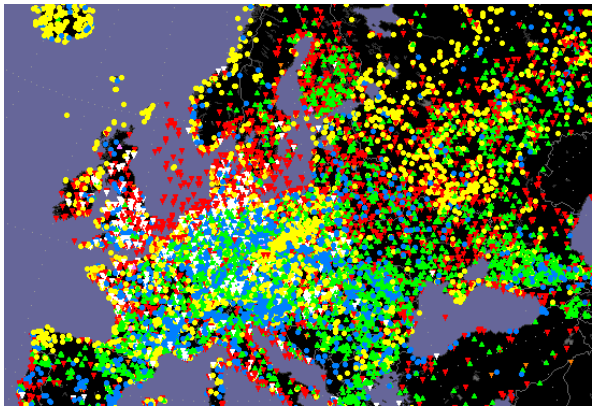

FIG. 3: Spatial distribution of events across part of the area covered by the ESWD. Different symbols represent different event types.

V. CONCLUSIONS

The ESWD database is a core activity of the European Severe Storms Laboratory, which is maintained with the help of a rapidly growing number of partners, that include several national (hydro-)meteorological institutes. New technical developments enable better interaction with the partner organizations and a new quality control scheme has been implemented. The fraction of data that has reached a higher quality level has since grown significantly.

The ESWD as a data source has in its short lifetime been used by several researchers including groups at NSSL, EUMETSAT and the DWD. The dataset has been used for climatological studies of several kinds, and by groups who seek to find ways to detect severe weather in an automatized way using satellite and or radar data, thereby needing ground-truth observations.

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All references can be downloaded from ESSL's website (http://www.essl.org).