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Seamless integration of flow and stock for the utilization of JMA-XML

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Flow and stock are two types of views on earth observation data. Flow refers to the quantity of information for a time slice, while stock refers to the quantity of information as a whole. The values of two viewpoints depend on the purpose of utilization.

Hence we believe that the seamless integration of flow and stock is an important challenge for the utilization of earth observation data. As a case study, we focused on the seamless integration of flow and stock for the utilization of Japan Meteorological Agency (JMA) disaster prevention information XML format (hereafter called JMA-XML). The operation of JMA-XML started on May 12, 2011, and the service was expanded on December 17, 2012 when it started an experimental service accessible by the general public. We started the archiving of JMA-XML since December 2012, to reach more than 730,000 bulletins as of February 2015. This stock of bulletins can be analyzed by the type, for example, such as about 175,000 weather forecast bulletins and 101,000 weather warning bulletins, with 69,000 special weather warning bulletins started on August 22, 2013.

JMA-XML is intended to be used as flow, so it has high familiarity with the automatic posting (bot) into a flow-oriented social networking system (SNS) such as Twitter. We started an account @JMAXMLAlerts which posts weather alerts constantly. However, conversion from flow to flow is an ordinary type of utilization, and we thought that conversion from flow to stock may lead to a more innovative type of utilization.

The first type of utilization is ”weather warning database.” This is the database of special warnings, warnings, and advisories (hereafter called weather warnings) announced from JMA, and it involves conversion from flow to stock because the announcement of activation and deactivation of warnings span across multiple bulletins. The period between activation and deactivation should be determined by maintaining a status of a warning by monitoring the flow of warnings. We released this database that updates in real-time with the implementation of this logic. The database contains about 13.2 million announcements of weather warnings, and about 1.75 million warning periods are extracted from the announcements. Each bulletin in the database also offers links to meteorological data such as satellite images and AMeDAS or disaster data.

This database reveals the number of warnings in history for each area. Hence we released ”weather warning risk map” with a hope that this statistics could be used as proxy for weather risks. For example, Akita prefecture has the largest number of warnings, among which dense fog advisories is the most frequent type. Does it mean that Akita prefecture has the highest risk for dense fog? This question needs careful scrutiny on the standard used for weather warnings. However, it naturally leads to a question if the issuance of weather warnings is fair across the country. These results indicate that flow information in a short time scale could be transformed to risk information in a long time scale through conversion from flow to stock.

We have been interested in the seamless integration of flow and stock. For example, ”Digital Typhoon” is the database of typhoons, but the core concept of the database is the integration of flow and stock, and aims at providing context for a proper interpretation of flow information through reference from flow to stock. We believe that this methodology could be applied widely to the utilization of earth observation data.

Keywords: weather information, database, JMA-XML, weather warning, risk map, flow and stock