

5. Rain on your radar: Engaging with weather data visualizations as part of everyday routines

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Abstract

This chapter discusses visualizations of weather data, used to communicate short-term precipitation predictions to lay audiences. Focusing on the example of *Buienradar*, a popular Dutch weather forecast website and app, it investigates how people engage with such representations on a daily basis, how they interpret them, and how their readings of them affect their actions and decisions, shaping their day-to-day routines. The research is based on semi-structured interviews with users with different demographic profiles. Aside from establishing usage patterns or preferences and readerly strategies, the chapter also considers people's own evaluations of their conduct in relation to the *Buienradar* service, and more broadly, their reflections on the significance of weather data visualizations to their lives.

Keywords: Weather data; Data visualization; Data usage; Readerly strategies; Daily life; Routines

Introduction

In late August of 2017, the spokesperson for a Dutch association of campsite owners criticized *Buienradar*, an often-used weather forecast website and app, for the financial setbacks its members had incurred over the course of the summer. In an interview with a local newspaper, he posited a causal relation between patrons' use of the service and cancellations received in the week prior to their stay (Baard & Hellegers, 2017). The news report

suggests that he primarily blamed the weather service itself, as a source of misleading information. But his statements also betray frustration with the customers, for blindly trusting the overly cautious predictions made.

While this position may sound extreme, it does build on widespread assumptions about how people today access, and act upon, information about the weather, as obtained via a range of (often digital) media. In 2001, the media scholar Marita Sturken already observed that the weather 'is no longer something one goes outside to register, that one experiences on the ground and in the flesh. It has become, rather, a technological experience, seen from satellites and endlessly monitored on television and the Internet' (2001, p. 161). But the above anecdote also invokes associations with the sort of (humorous) comments, proliferating online, that suggest that people these days would rather believe what their weather apps tell them than to trust their own senses.

Buienradar, the main target of the campsite owner's frustrations, is something of a household name in the Netherlands. Launched in 2006, it was the first service in the country to make use of data from KNMI, the national weather office, in order to visualize, in rather distinctive ways, both recent and current rainfall, as based on precipitation detections, and projections for future rainfall. Its present default view has two key elements (see Figures 5.1 and 5.2 below). On the one hand, the actual *buienradar*, literally 'shower radar': a map of the Netherlands showing rain clouds in different colours, denoting the amount of rain (in mm/h) observed or predicted, traversing the territory in small increments. And on the other, a so-called *regengrafiek* or 'rain chart': a line graph showing the amount of rain per temporal unit for a given place. In addition, the platform also provides information and predictions on a range of other weather phenomena, in different forms and for different time frames.

Informal exchanges with users suggest that *Buienradar*'s data visualizations, or readings thereof, affect how they live their lives on a daily basis. But the sorts of actions and decisions mentioned are generally more mundane than those alluded to in the anecdote above. In addition, such conversations reveal that we do not actually *know* very much about how readings of weather visualizations precisely take shape. Nor, for that matter, about how such representations, with all the epistemic power they wield and the interpretive pitfalls they present (cf. Kessler & Schäfer, 2018; Smith, 2018), get navigated on a daily basis, as part of the routines of people's everyday lives.

In recent years, data scholars have deplored the dearth of empirical study into how people encounter, use, and reflect on data on a daily basis (e.g. Couldry & Powell, 2014, p. 2; Michael & Lupton, 2016, p. 110; Pink, Sumartojo,



Figures 5.1 and 5.2. Default views for the Buienradar website and (Android) app for Monday April 30, 2018 at around 11:35 a.m. CET. Screenshots by Eef Masson, used under quotation exception. Copyright 2006-20 by RTL Nederland.

Lupton, & Heyes La Bond, 2017, p. 2). Specifically, they have identified the experiences of non-experts and the relations between data use and everyday activities as ‘critical absences’ in research so far (Kennedy, 2018, p. 19). With this chapter, we want to make a preliminary contribution to the shared attempt—among others through this volume—to start a scholarly debate on the topic.

In doing so, we position ourselves on the intersection of two types of research. On the one hand, we want to build on previous studies of the ways in which *data usage is integrated into daily life*. With the spread of consumer digital media, there is a renewed interest in how media employment relates to ‘everyday temporalities, materialities and routine’ (Pink & Leder Mackley, 2013, p. 680). Here, we focus specifically on interactions with data *visualizations*. On the other hand, we also want to learn more about how people concretely *read and understand such visualizations* (Ruckenstein, 2014), once again in relation to the situations of which their use is part. In this respect, our research builds on a lengthy tradition of reception research. This tradition, we argue, retains its relevance in the digital age—especially insofar as it considers how the understanding of texts as sites of semiosis is affected by their various ‘contexts’, for instance technological or social (see Livingstone & Das, 2013, pp. 105-106; Mathieu, 2015, pp. 16, 19).

In the opening sections of the chapter, we briefly introduce the *Buienradar* service and explain how we conducted our exploratory empirical research into people’s use and understanding of the visualizations it provides. Next, we discuss our results. We focus, first, on what we learned about how people commonly *use Buienradar*, and which views or settings they prefer, and why. Then, we relate how they actually *read* them. Here, we consider questions both about the relations they establish between data, their representation, and acts of interpretation, and about the readerly strategies they apply. Finally, we look at how users *act upon* their readings and integrate them into their everyday routines, concluding with a section on the *broader significance* of the *Buienradar* visualizations to their lives.

***Buienradar*: Some background**

Buienradar was developed by three Dutch siblings, but inspired by a practice observed on American television (e.g. Galasz, 2014): the broadcasting of short-term precipitation projections based on public, radar-generated weather data. Initially, it exclusively provided precipitation information, based on data obtained from KNMI; later, it broadened its scope to other atmospheric

conditions such as temperature, relying also on additional sources. In 2011, the company was bought by the commercial broadcaster RTL, which now operates the website and apps. Use of the service has always been free, with revenue coming from advertisements.

In promotional texts, *Buienradar* defines itself primarily in the following terms: as a platform for (precise) information about precipitation, in visual form, at very short notice. Its creators claim that in launching the service, they appealed to a desire among audiences for forecasts that were both easier and quicker to read, and more unambiguous than those offered through other channels. Users of weather media, they argue, felt hampered by the ‘intervention’ of experts. On the one hand, because they craved precision and certainty rather than nuance and cautiousness; on the other, because they were rarely interested in how predictions came about. The initiators expected that in providing ‘direct’ access to weather data, the service would enable the user to take a meteorologist’s place, seeing ‘at a glance’ what was to happen at specific points in time (e.g. Ermstrang, 2011).

Despite increased competition, but also critique from weather experts (critique variously concerning the implausibility of very precise precipitation predictions, or the flaws of the particular technology for data collection that the service capitalizes on; see e.g. Galasz, 2014; Elegeert, 2015; van Leur, n.d.), *Buienradar* remains highly popular in the Netherlands. In February of 2018, the website and app together reached 3.8 million local users (Verenigde Internet Exploitanten, n.d.)—almost 25 percent of the population over the age of six. But their cultural significance arguably reaches much further, as our interviews suggest that the name ‘Buienradar’ is sometimes used eponymously for similar services.

Methodological considerations

In light of our wish to gain preliminary insight into how people understand weather data visualizations in relation to the specifics of their everyday lives, we chose to conduct a series of interviews as a basis for our observations. This way, we were best able consider the mutually productive relation between the two, taking into account that daily routines do not merely ‘accommodate’ for interactions with data, but also shape those interactions, and vice versa (e.g. Pink et al., 2017). This method also has the advantage that it allows us insight not only into people’s understandings of weather data visualizations and their experiences of living with them, but also into how they personally assess them. Such reflection by users is of interest here,

because it is informative of how they personally gauge the importance of visualizations and because it sheds light on their own perceptions of the issues such representations raise and the pleasures they provide.

Our findings are based on semi-structured interviews with sixteen users of the *Buienradar* website and app. In selecting respondents, mostly from our personal network, we sought to consider the diversity of actual experiences among a range of people. This resulted in variations in age (with participants between 25 and 71, more or less evenly spread across the decades) and gender (eight men and eight women), family structure (people living alone or with a partner, versus members of families with children) and occupation (salaried versus self-employed, and within different sectors). Arguably, our sample is somewhat biased in terms of educational level, in that most of the people we interviewed have completed some form of further education (vocational or academic). Also, for practicality's sake, all interview subjects have been recruited from the Randstad area of the Netherlands (the megalopolis comprising the country's largest cities), where we live and work. Most of the interviews lasted between ten and twenty minutes, and they followed roughly the same pattern.

Usage patterns and preferences

Most of our interviewees regularly access information about the weather; two thirds do so at least once a day. About half of them rely for this purpose on the general news media: broadcasts on radio or television or (online) news publications. Oftentimes, they do not actively seek out such information, but encounter it as part of their daily routines in media consumption. Those who go looking for forecasts tend to prefer specialist websites or apps (sometimes as pre-installed on their devices). Overall, source selection is quite arbitrary: respondents often alternate between services, and 'googling for the weather' is common, especially in looking for longer-range predictions (e.g. prior to holiday travel).

If we compare forecasts in the mainstream media and on general weather sites with those provided by *Buienradar* and similar services, more distinct user patterns emerge. 'Traditional' forecasts, as we know them from newspapers and TV, tend to focus on averages for the day and week, and mostly feature still or animated maps and tables with icons and numerical information (see Figure 5.3). Generally speaking, people opt for *Buienradar* when they are looking specifically for predictions of rainfall (as opposed to other weather conditions) that are also more precise—both in terms of

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Deze zaterdag wordt het met een zwakke tot matige noordoostenwind minder warm dan de afgelopen dagen, vooral in het noorden van het land. Daar blijft de temperatuur onder de 20 graden steken. Alleen Zuid-Limburg blijft nog in de extreem warme lucht. Daar wordt zaterdagmiddag 24 en lokaal 25 graden.

Verder schijnt de zon weer volop. Komende nacht daalt de temperatuur naar 7 tot 13 graden. Zondag wordt er met zuidelijke winden opnieuw warme lucht aangevoerd. In het noorden wordt het 21 of 22 graden.

Zomers warm, met temperaturen van 25 graden, wordt het in heel Limburg en in het oosten van Brabant. Tegen het eind van de dag neemt de kans op een zomerse onweersbui vanuit het zuidwesten toe. Vanaf maandag is het met 14 graden een stuk minder warm, maar niet koud. Deze temperatuur is normaal voor deze fase van april. Het is ook wisselvallig met vooral dinsdag en donderdag wat regen. Op vrijdag, Koningsdag, is het 16 graden. Af en toe laat de zon zich zien, maar er is ook 50 procent kans op een bui.

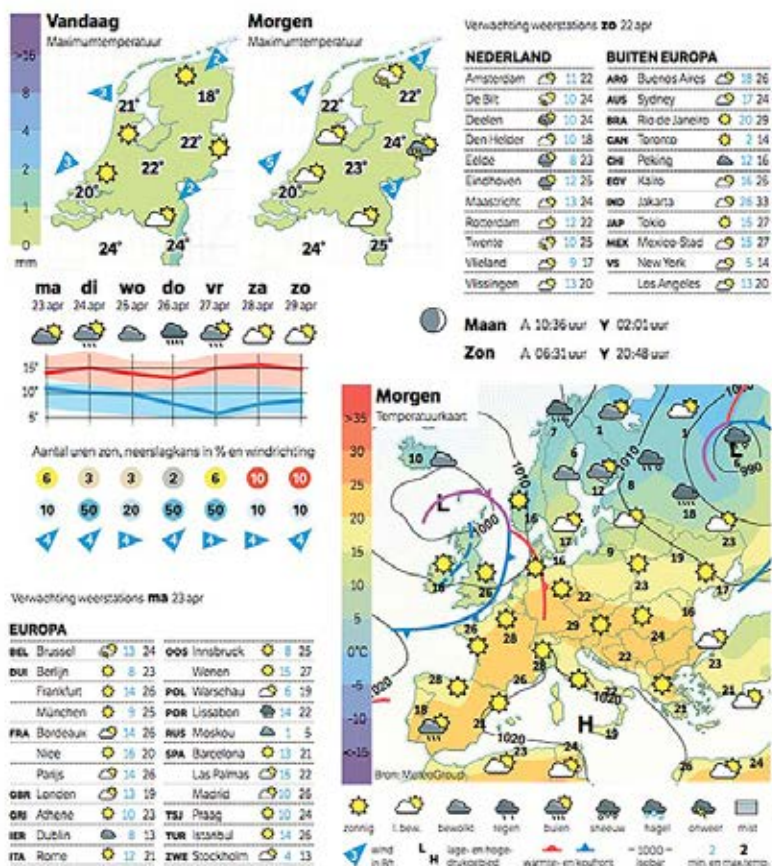


Figure 5.3. Weather report with textual and graphic elements in *NRC Handelsblad* (a Dutch national newspaper) for the weekend of April 21 and 22, 2018. Screenshot by Eef Masson, used under quotation exception. Copyright 2018 by *NRC Handelsblad*.

when and where the rain will fall. As a rule, moreover, they are interested in short-term predictions (that is, information concerning the next one to three hours).

Respondents tend to use *Buienradar* as they are about to undertake an activity that involves leaving the house, often for a journey somewhere. Overwhelmingly, interviewees establish a relation here with bicycling—a highly common means of transportation in the Randstad area. Other activities that prompt them to consult the service range from such day-to-day pursuits as walking the dog or hanging the laundry to dry, to sports practice at different levels of expertise. While some users check *Buienradar* as a matter of habit, others do so only if it is either (heavily) raining already, or if they have reason to believe that it might. In other words, people are motivated to access the platform by a desire to know if they may ‘get wet’—often in hopes that they can adapt their plans so as to avoid it. In this respect, the intensive use of weather apps seems to have engendered a shift in terms of how weather forecasts are commonly used (cf. for instance Lazo, Morss, & Demuth, 2009, p. 792).

Our conversations also reveal strong but diverging preferences for specific *Buienradar* functionalities and types of visualization. In addition, they suggest that users, over time, develop their own habits in navigating them. As regards preferences, our respondents roughly divide into three groups, based on whether they are interested primarily, or even exclusively, in the aforementioned ‘shower radar’ (map representation) or ‘rain chart’ (line graph), or a combination. A majority prefer the geographical representation, focusing in their readings on the relation between current location (sometimes set to default, so that the map shows only a select part of the country; see Figure 5.4) and the timing of a given stage in the animation of rainclouds moving over it. Others, however, radically prefer the line graph, often with the argument that it is ‘clearer’ or that it provides ‘more specific’ or ‘more detailed’ information (either in terms of location, or in the sense that rainfall is more precisely quantified). For yet another group of respondents, use of the map and graph forms part of a two-stage process, whereby the graph is consulted for additional information.

Aside from the map to chart navigation, common interactions with the default view involve zooming in on the map, and specific ways of toggling between the one- and three-hour views (on the website) or moving one’s cursor between different projection times (all media). Those who navigate beyond the initial map and chart (roughly half of our respondents) tend to do so only incidentally, and often in search of other kinds of information than about precipitation.



Figure 5.4. Shower radar and rain graph visualizations on the *Buienradar* website, set to Amsterdam, for Monday April 30, 2018, 11:35 a.m. CET. Screenshot by Eef Masson, used under quotation exception. Copyright 2006-20 by RTL Nederland.

***Buienradar* readings: Data and visualization, prediction and interpretation**

Each interview began with a request to explain to a hypothetical interlocutor what *Buienradar* is. In retrospect, the answers given are quite revealing of people’s understanding of the service. Most characterizations focused either on the predictive aspect of the information provided or on the fact that it is rendered in a primarily visual form. In some cases, respondents highlighted precisely the combination of those features. A couple of interviewees also named a specific *type* of representation, usually ‘map’ (a choice suggesting the close association of *Buienradar* with the geographic view, in the common perception). A few even used such terms as ‘photographic’ or ‘radar’, alluding

to the specific imaging technologies that they (mistakenly) assumed were used to produce the views. Interestingly, a select few also characterized it as a platform enabling the consultation of weather 'data'; however, only one used the term 'visualization' (importantly, someone with a professional interest in the topic). In other words, respondents tended to be acutely aware of the fact that what *Buienradar* offers are representations—even if they did not actually conceptualize them as data visualizations and were in doubt as to which other label to use instead.

Furthermore, formulations used throughout the interviews attest to diverse, and in some respects contradictory, assumptions about the role of data and interpretation, both in the information provided and in the way *Buienradar* presents it. This diversity manifests the most clearly if we separate claims along those two dimensions: statements about weather information, specifically prediction, and about weather (data) visualization.

With respect to the former, users overwhelmingly seem to understand information that concerns future conditions as interpretive, and by implication, as products of human intervention. Overall, they are also quite permissive here in matters of accuracy: since the weather is hard, perhaps impossible, to predict, it is not at all odd that forecasts are not always 'right'.

However, readings of the *Buienradar* views as *representations of data* or information reveal very different assumptions about what exactly it is users are presented with. Formulations that show awareness of the representational status of the shower radar, rain chart, or any of the other visualizations provided still attest to an understanding of their relation to reality as barely mediated. Telling in this context was the use, during interviews, of such terms as 'photographic' or 'radar' (the latter likely prompted by the tool's own name). Aside from the fact that such choices in wording attest to an at best rudimentary understanding of the relation between weather data and their registration, as well as their visualization, they also suggest that interviewees infer a direct, indexical relation between what they see on *Buienradar*, and 'the world out there'. Moreover, interpretations were often phrased in terms suggestive of the visualizations' presumed objectivity and evidentiary power. In this respect, they align with the service's self-promotion as one that provides direct access to 'raw data', eliminating in the process any form of human 'meddling'.

Evidently, the dimensions of weather prediction and data visualization, in the respondents' accounts, cannot always be disentangled. Even so, the interview results attest to these users' desire to also consider the merits of the representation as such; for example, in comments on the clarity of

maps, charts, or tables. Once again, this suggests that they have an eye for what data visualizations do—even when they obscure their own status as representations.

***Buienradar* readings: Interpretive strategies**

Aside from navigational habits, the users we interviewed also displayed personalized readerly routines. During the interviews, we asked them to vocalize their thought process as they contemplated the different visualizations. In doing so, we realized that their interpretations came about in intuitive ways and were often based on information once verified but then modified as part of individualized reading strategies. In many cases, for instance, interpretations of the map visualization accounted for the colour of animated clouds. However, while the map's legend is quite unequivocal about how those colours are encoded, the interviewees' readings of them were highly diverse. Many understood them in terms of rain intensity ('how heavily it will rain'), an interpretation that ties in quite closely with their actual coding in terms of precipitation volumes. Others, however, did not take the colours to carry any meaning at all. And some respondents, including some true *Buienradar* aficionados, associated them with rather more complex or encompassing atmospheric conditions (for instance, 'red' as taken to denote 'thunder' or 'stormy weather'). These last examples suggest that our users, even if they built in their interpretations on what they had previously heard or read about the codes deployed, would oftentimes add to or tweak the information obtained.

However, such reading habits do not necessarily derive from limited engagement with the site or app, or the visualizations specifically. In this respect also, our data show considerable differences between interview subjects, who may be roughly divided into two groups based on the expectations they have from the service. Those in the first group tend to avoid information and representations that present some sort of an interpretational hurdle, for instance because they require non-standard knowledge. One map user for instance complained that the rain graph mistakenly presumes that the user understands what it means to confront a specific amount of precipitation (in mm). Respondents in this group therefore also applied simplifying reading strategies (e.g. interpreting the line in said graph as indicative of 'rain' or 'no rain', rather than a certain measure of precipitation). Another interviewee had difficulties interpreting tables with probability figures (presumably, a common issue in the reception of weather forecasts;

see Gigerenzer, Hertwig, Van Den Broek, Fasolo, & Katsikopoulos, 2005), which he therefore avoided. A select few also expressed a preference for simplicity in visual design, objecting to the *Buienradar* (desktop) site's overly cluttered interface or overload of information.

A second group of respondents, by contrast, seemed prepared to engage much more deeply with the service's representations. They made elaborate studies of their preferred weather visualizations, or took a comparative approach, contrasting the different visualizations amongst each other and even with those on other sites or apps. Some did so from a critical impulse, suspicious of either weather prediction or visualization practice. Others took this approach because they needed to very precisely plan (recurrent) activities that were weather-dependent, such as outdoor sports. These accounts suggest that in accessing the service, both factions tried to 'penetrate its underlying system', so as to be able to see more clearly what the prediction and/or visualization algorithms actually do. Arguably, they thus attest to a drive to 'take the forecasters' place'—but with a different motivation than *Buienradar*'s initiators anticipated. Here, the perceived problem is not one of specialist intervention (which it is, for *some* users!) but rather, that the access to data that *Buienradar* provides is not quite 'direct' enough—in spite of the makers' pledges. For this group, unimpeded access is in the interest of a more nuanced understanding of the reality the data reference, and presumably, the data's representation blocks this reality from view.

***Buienradar* in the routines of everyday life**

Many of our participants who access *Buienradar* prior to open-air activity take practical decisions based on their readings of the visualizations encountered. They use them for instance in determining what to wear or how to dress the children, whether to take further protective devices such as umbrellas, or even—if they have the choice—which means of transportation to choose. Prior research suggests that such decision-taking habits are common for forecasts across the board, regardless of the media or representations involved (cf. Lazo et al., 2009, p. 792). A difference, however, is that *Buienradar* users sometimes also delay their plans, or even cancel them, quoting the very precise information the service provides. While obviously more common in people who have more of a hand in how they organize their days, such behaviour was widespread amongst our participants.

Lazo, Morss, and Demuth (2009) observe that weather forecasts, as forms of communication, are ‘part of the infrastructure of our lives and livelihoods’ (2009, p. 795). The *Buienradar* case confirms this, to the extent even that accessing the site or app has become profoundly entwined with people’s daily routines and patterns of behaviour. We distinguished earlier between those people who check the service when prompted by current weather conditions and those who do it as a force of habit. For the latter, the act of checking becomes inextricably interwoven with moments of departure. One account further suggested that such behaviour may be engrained in the social conduct of (specific) collectives. The respondent in question—someone in his early thirties—related that during outings with groups of peers, whenever plans were being made to move from one location to another, one person would always check *Buienradar*.

At times, the habitual use of such weather services may even become a routine in itself, functioning as a propeller in (re)shaping the flow of everyday life (cf. Nansen, Arnold, Gibbs, & Davis, 2009). One interviewee, a homemaker, explicitly assigned the service a role in setting up her day, but also claimed that the mere act of accessing the site helped her give her life substance. Arguably, this is only possible because *Buienradar* provides a continuous stream of perpetually updated information—much like other contemporary (social) media do.

Summing up: *Buienradar*’s significance to people’s lives

At the beginning of this chapter, we referenced some sources that observe a widespread blind trust in information about the weather as presented by such services as *Buienradar*. Our own account suggests that users do indeed take the platform’s visualizations very seriously, in that they consult them repeatedly and act upon how they read them. However, they seem to do so *in spite of* a profound scepticism towards the information the platform provides. In the context of our conversations, such mistrust often derived from awareness of the fundamental unpredictability of atmospheric conditions, informed by a diverse body of (lay) knowledge about the limits of weather forecasting. But in a select few cases, interviewees also attributed it to the intricacies of data visualization (unsurprisingly, mostly respondents engaged in study or professional activities that presuppose a certain interest in such matters). For example, a couple of users argued that the *Buienradar* maps and charts were (necessarily) selective in what they show, and one person suspected that they might actually be misleading.

Another was even prompted by the interview to wonder about which data models were used, and how this affected what she saw. Yet as a rule, such understandings did not seem to prevent the speakers from relying on the service. With reference to Sturken, we therefore conclude that today still, there is a widespread yearning for an experience of control through monitoring—even of something as fundamentally uncontrollable as the weather (2001, pp. 162, 165).

In light of the above, it is hardly surprising that people gave rather ambiguous answers to questions about *Buienradar*'s importance to their lives. On the one hand, they found the service very useful. Some argued that while they previously did 'just as well without', not having it would require an adjustment—and a far-reaching reorganization of their daily routines. A few respondents actually found this scenario appealing, as they realized that *Buienradar*'s use profoundly impacted on the rhythms of their personal lives, or even, on people's sense of self-reliance. But on the other hand, they also took care to put the service's importance into perspective, pointing among others to the banality of the information provided and the availability of practical solutions and precautions. Overall, their behaviours supported the sincerity of their claims. For instance, several respondents related that they decided at some point to remove the (storage-consuming) *Buienradar* app from their phones, opting instead for the mobile site, because other functionalities were more crucial to their lives (a navigation tool, for instance, or more space for pictures).

Presumptions of 'blind trust' in the face of technology are further undercut by people's profound awareness of their own habits as users, and above all, by their preparedness to reflect on them. Many interviewees volunteered to comment—albeit sometimes with shame or in self-mockery—on the paradoxical aspects of their behaviour: the apparently inverse relation between how they act upon *Buienradar* information, and a fundamental suspiciousness towards what the service does (predicting) or how it does it (selectively visualizing extrapolated data). Some also showed awareness of the social conditioning of their conduct, and of the relation between the platform's economics (e.g. its use of adverts) and their dependence on it. A few even expressed appreciation of the pitfalls of an increasingly datafied existence—either for political reasons (e.g. in light of data collection and privacy-related issues) or social ones (as in the comments on self-reliance). This strengthens us in our conviction, inspired by Couldry, Fotopoulou, and Dickens (2016), that we cannot reduce the users of data visualizations to actors without agency, and should be alert also to signs of reflexivity.

Presumably, one reason why such critical attitudes are easily overlooked is that they may actually coincide with (intensive forms of) use. And even, we would like to add, with *enjoyment* of such use. Several of our respondents access *Buienradar* also because they derive some form of pleasure from engaging with its visualizations. For example, one Amsterdam resident explained that she finds the default map view the more attractive one, because it not only shows what is going to happen in her current location, but also ‘how a rain shower develops’ as it passes east over the country, which she finds ‘fun to watch’. While she also derives pleasure from studying physical indicators of atmospheric conditions or developments—for instance, the movement of a real-life flag or vane—there is an added appeal to weather observation via the shower radar. This suggests in turn that *Buienradar*’s use for monitoring the weather is about more than just ‘mastering’ one’s experiential world: it is also about engaging (in the process) with the latest technologies, and the particular gratification this provides.

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