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How to communicate quality information?

In Norway we have had advanced quality flag accessible for data in some years now. This quality flag has been decoded to a still advanced 5 digit codes use-info-flag. To help the audience to decode this we have made a quality level (0-7) from OK data to Erroneous data.

We do not have a complete set of good quality checks yet. Some examples will be given of how use of quality information levels give sparse with data accessible and opposite no use of quality information can give too much suspicious data available. How can people rely on our data? What does 'very suspicious data' mean for them? Some users want a best suggestion value instead of nothing, and some users want highly quality controlled and homogeneous values. Are the data trustworthy? Data from met.no can have quality level 2 or 4 which mean slightly uncertain. Has this the same meaning throughout Europe and elsewhere in the world?

In eKlima it is possible to get quality information together with the data, but default presentation is without quality information because users seem the added information as confusing. Some examples of different presentations will be given. So is it any use to bring in quality information to external users?

Presentation of quality information is a theme it is necessary to discuss.



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How to communicate
quality and confidence
information?

Solfrid Agersten

(Thanks to Lars Andresen
and Per-Ove Kjensli)



Be aware that this speech is inspired by Søren Kierkegaard, the Danish philosopher who is called the father of the existentialism.

Subjective \leftrightarrow Objective



Why do we have data controls?

- By default we are suspicious of the data because we have quality controls...
- How trustworthy are the data from the instruments? Dependent on:
 - The instrument
 - The weather element to observe
 - The observer
 - The data network
 - The data receiver



Is it possible to set objective criteria
for the confidence of data?



Quality control flag in operations

- Set a flag for every quality check
 - Too strict checks or the opposite...?
- Correct data
 - Automatically
 - Manually
- Simplify the flag for the user
 - OK, slightly uncertain, very uncertain, erroneous
- Restrict the data published to the user
 - Only OK data and some uncertain data



Who is the user?

- The naive user
- The careless user
- The picky user
- The skeptical user
- The expert user
- The researcher



How is the quality information used?

<http://yr.no>:

- only OK and data flagged as slightly uncertain
- no information about quality

<u>Kygge</u>		4,0	←
Akershus			
<u>Aurskog</u>		3,4	↘
<u>Hakadal (Bliksrudhaugen)</u>		1,1	↗
<u>Hakadal stasjon</u>		1,2	↘
<u>Gardermoen</u>		0,9	○
<u>Asker</u>		1,8	↙
Oslo			
<u>Alna</u>		2,6	↘
<u>Bjørnholt</u>		0,2	
<u>Oslo (Blindern)</u>		2,9	↘
<u>Tryvasshøgda</u>		-0,6	←
Hedmark			
<u>Trysil</u>		0,5	↗
<u>Drevsjø</u>		0,4	↗
<u>Kongsvinger</u>		2,1	↙
<u>Flisa</u>		2,0	↗
<u>Lindesnes fyr</u>		7,7	↗
<u>Lista fyr</u>		7,5	↙
<u>Sirdal (Tjørhom)</u>			
<u>Sinnes</u>		2,7	↙
Rogaland			
<u>Eik</u>		6,0	↘
<u>Obrestad fyr</u>		6,9	↗
<u>Særheim</u>		7,2	↗
<u>Sola</u>		8,9	↗
<u>Kvitøy</u>		8,6	↗
<u>Stavanger (Våland)</u>		8,0	
<u>Fister</u>		8,9	←
<u>Sauda</u>		5,4	
<u>Nedre Vats</u>		8,6	↙
<u>Haugesund lufthavn</u>		8,5	↗
<u>Utsira fyr</u>		8,6	↗
Hordaland			
<u>Shasa (Kjevlia)</u>			
<u>Steinkjer (Egge)</u>		0,0	○
<u>Namsos lufthavn</u>		4,7	↙
<u>Nordli (Holand)</u>		0,1	↘
<u>Gartland</u>		2,6	↙
<u>Namsskogan</u>		3,8	↙
<u>Rørvik lufthavn</u>		6,6	↗
<u>Nordøyan fyr</u>		6,8	↗
<u>Skinna fyr</u>		6,7	↗
Nordland			
<u>Brønnøysund lufthavn</u>		8,5	↗
<u>Vega</u>		7,8	↗
<u>Tjøtta</u>		7,4	↙
<u>Sandnessjøen</u>		5,5	↗
<u>Mosjøen lufthavn</u>		4,8	↙
<u>Maiavatn</u>		2,3	↗
<u>Varntrask</u>		1,1	↗



eKlima

- Intention to serve most of the users.

Select the display of quality information ?

Select accepted quality limit for data in report:

Don't show Show with colour code

Very uncertain
OK
Uncertain
Very uncertain
Very uncertain, modeldata

Show quality information in:

Separate column Same column Separate table

Show quality information as:

Text

Next ->

Fullfort



Use of quality control flags

- Manual corrected data: OK or uncertain?
- Automatically corrected data: OK or uncertain?
- Model data
- Is uncertain data good enough for viewing on the Internet?



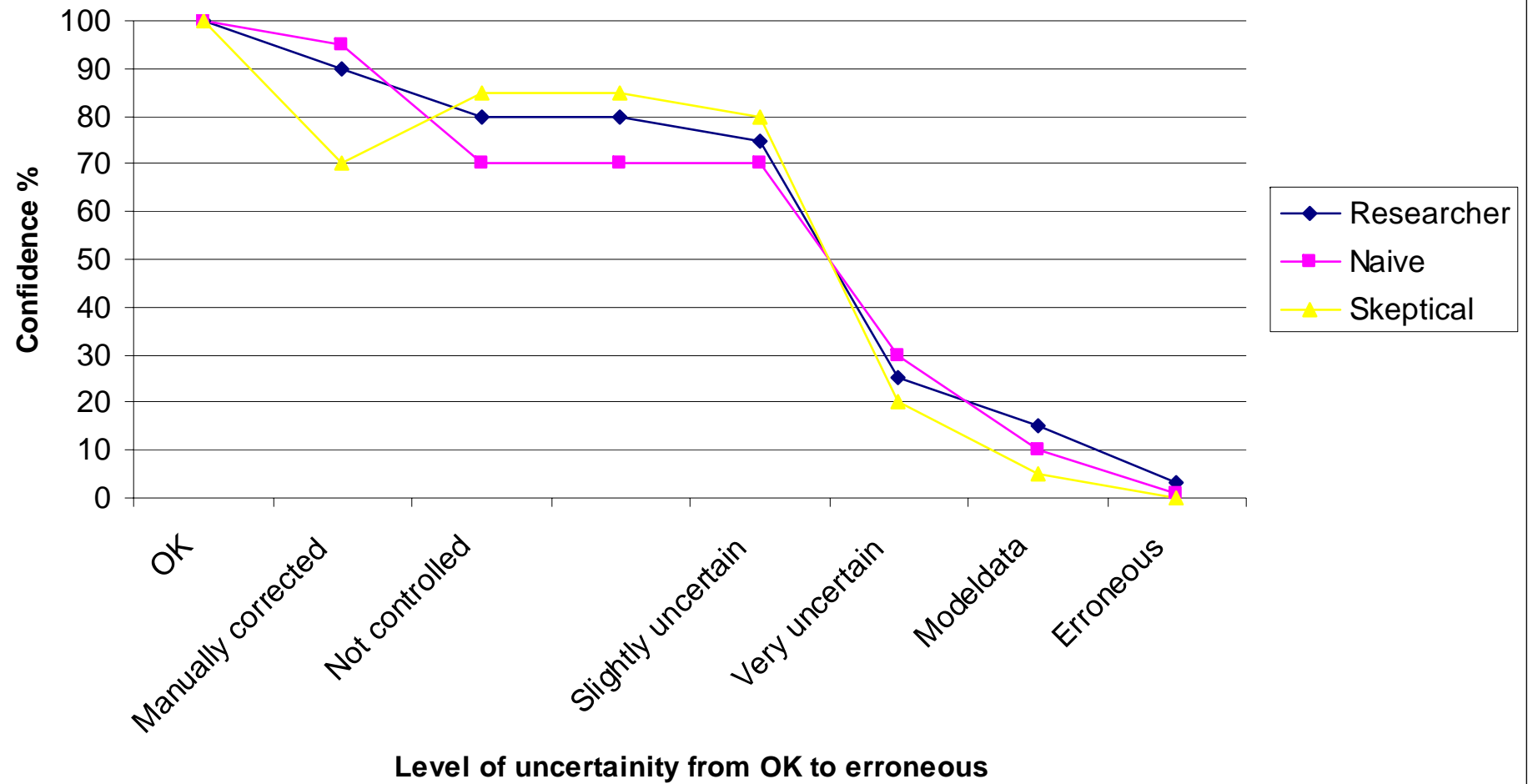
Level no	Symbol	Code	Text	Description
-2				Reserved - not in use
0	*	OK	OK	Value is controlled and found O.K
1	*	OK	OK	Value is controlled and corrected, or value is missing and interpolated manually.
2	+	LU	Slightly uncertain	Value is not controlled.
3	+	LU	Slightly uncertain	Reserved - not in use
4	+	LU	Slightly uncertain	Value is slightly uncertain (not corrected).
5	!	SU	Very uncertain	Value is very uncertain (not corrected).
6	?	SU-M	Very uncertain, model data	Value is controlled and corrected, or value is missing and is interpolated - automatic.
7	-	FE	Erroneous	Value is erroneous (not corrected)



Is it possible to quantify
the probability for the data
to be correct?



Perception of quality information





How to ensure good quality control?

- Data provider must know the connection between the
 - Quality control checks
 - The flag settings
 - The 'confidence' of the data.
- User doesn't care about checks and flags, **but** the *confidence*
- It is not possible to say anything about the confidence without having correct flags...



What is a correct flag?

- Information about which checks that assume the data-value is
 - wrong
 - correct

Example:

If check QC-5 has detected Y faults of Z possible.

How likely is it that the data is OK?
($p=1-Y/Z$)?



What is a correct check?

- Dependent on data-type
- Dependent on criteria - input parameters
- Are the checks independent?
- Quantify the reliability of the checks to find weights for the checks.
- Find total confidence based on the weights of the checks.



Is it possible to find objective weights for different checks?



Hypothesis

We will never be able to ignore:

- the user's perception of probability
- the user's confidence in the data
- nor the perception of the researcher (who defines the checks and sets the weights and then defines the confidence of the data)



Do you want to take the challenge and
prove me wrong?

Science is to minimize the user
perception, to get a general valid
truth...