

27-29 May 2024 

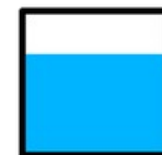


imdis

International conference on Marine Data and Information Systems



MARIS



National
Oceanography
Centre



iImagine



eosc
Blue-Cloud2026

A new online app for ocean temperature quality control - An artificial intelligence approach

Sebastian Mieruch and Mohamed Chouai
Alfred-Wegener-Institute (AWI), Bremerhaven, Germany

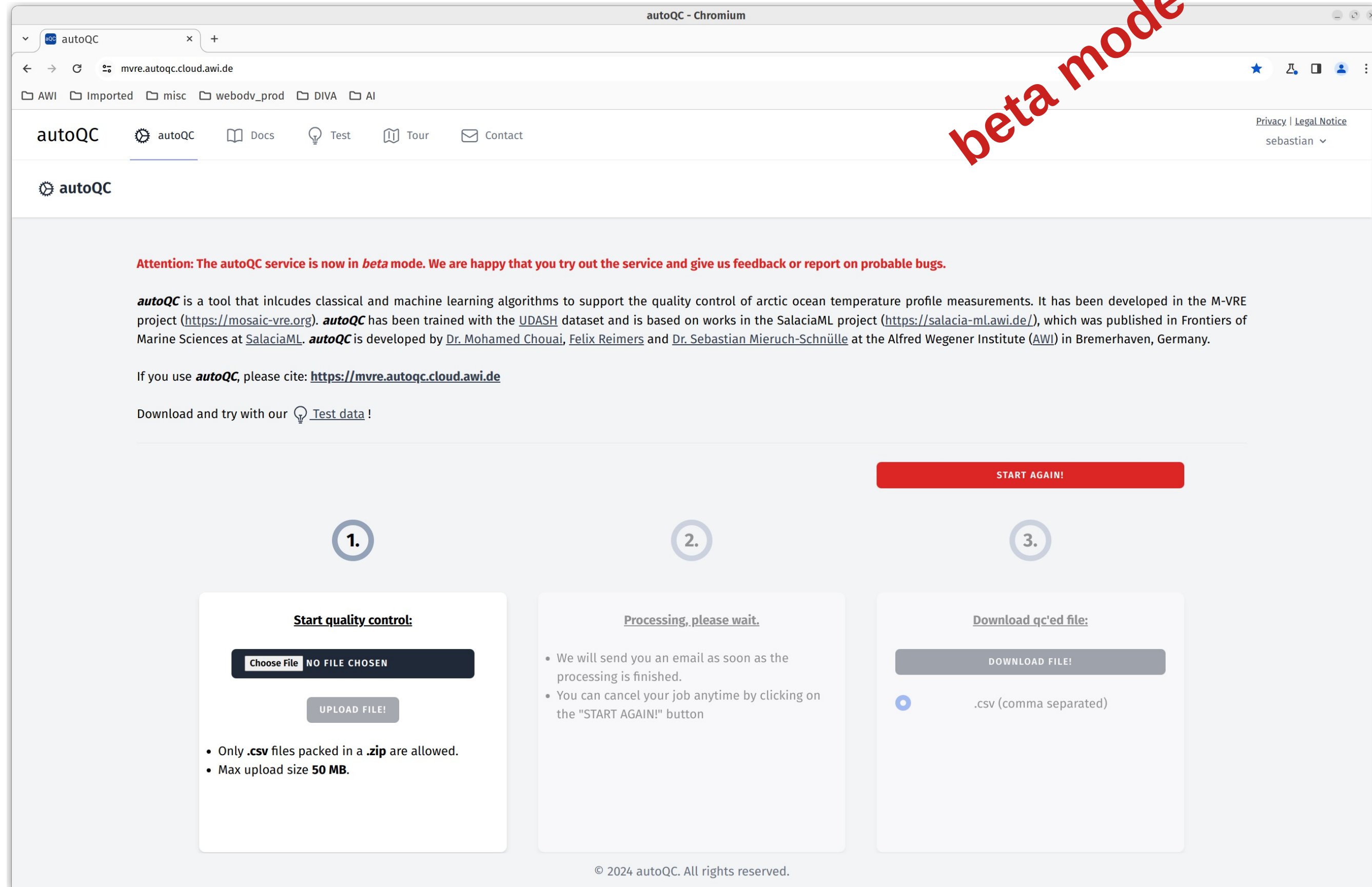


Bundesministerium
für Bildung
und Forschung



ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG

The app: <https://mvre.autoqc.cloud.awi.de/>



autoQC - Chromium

mvre.autoqc.cloud.awi.de

AWI Imported misc webodv_prod DIVA AI

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sebastian

autoQC

Attention: The autoQC service is now in *beta* mode. We are happy that you try out the service and give us feedback or report on probable bugs.

autoQC is a tool that includes classical and machine learning algorithms to support the quality control of arctic ocean temperature profile measurements. It has been developed in the M-VRE project (<https://mosaic-vre.org>). **autoQC** has been trained with the UDASH dataset and is based on works in the SalaciaML project (<https://salacia-ml.awi.de/>), which was published in Frontiers of Marine Sciences at SalaciaML. **autoQC** is developed by [Dr. Mohamed Chouai](#), [Felix Reimers](#) and [Dr. Sebastian Mieruch-Schnülle](#) at the Alfred Wegener Institute (AWI) in Bremerhaven, Germany.

If you use **autoQC**, please cite: <https://mvre.autoqc.cloud.awi.de>

Download and try with our [Test data](#) !

START AGAIN!

1.

Start quality control:

Choose File NO FILE CHOSEN

UPLOAD FILE!

- Only **.csv** files packed in a **.zip** are allowed.
- Max upload size **50 MB**.

2.

Processing, please wait.

- We will send you an email as soon as the processing is finished.
- You can cancel your job anytime by clicking on the "START AGAIN!" button

3.

Download qc'ed file:

DOWNLOAD FILE!

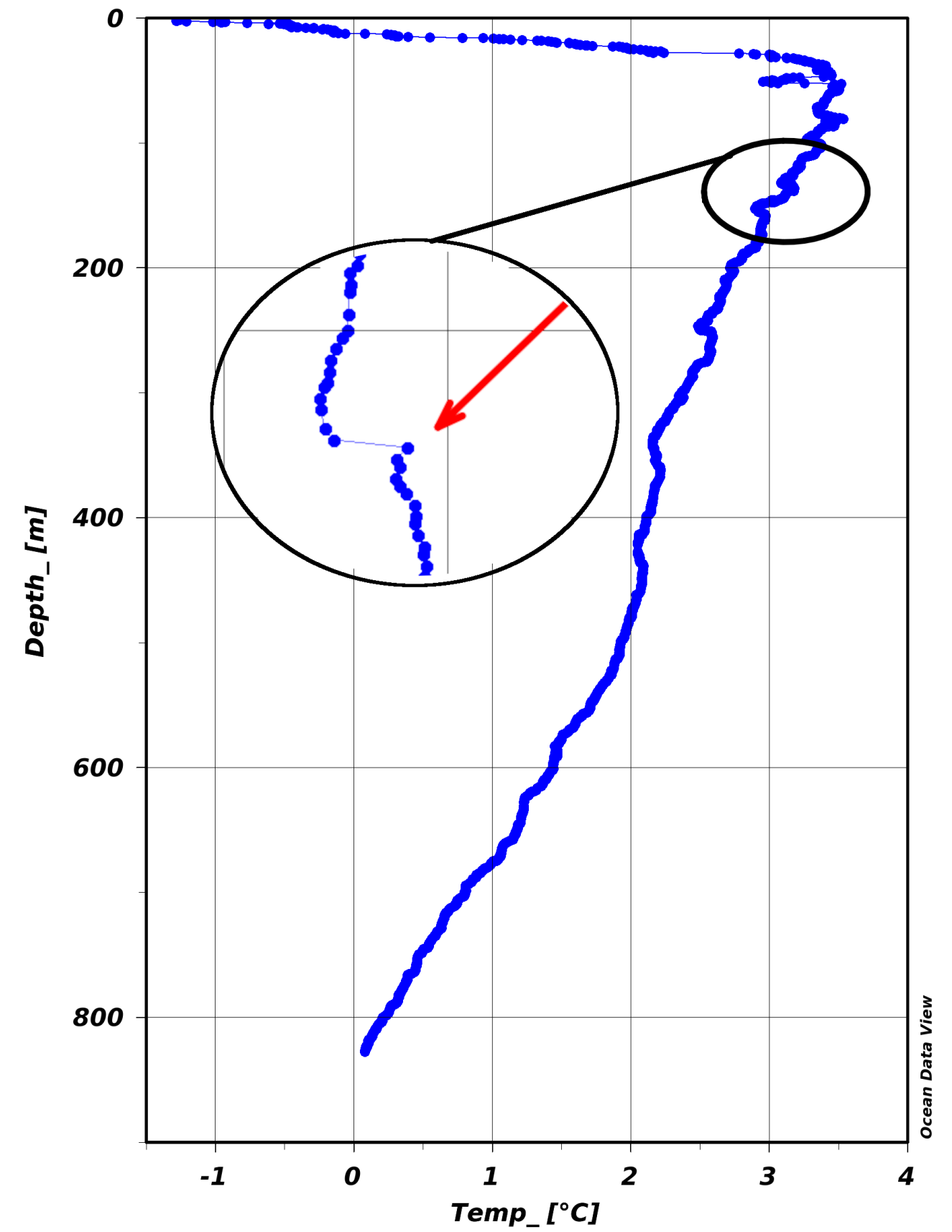
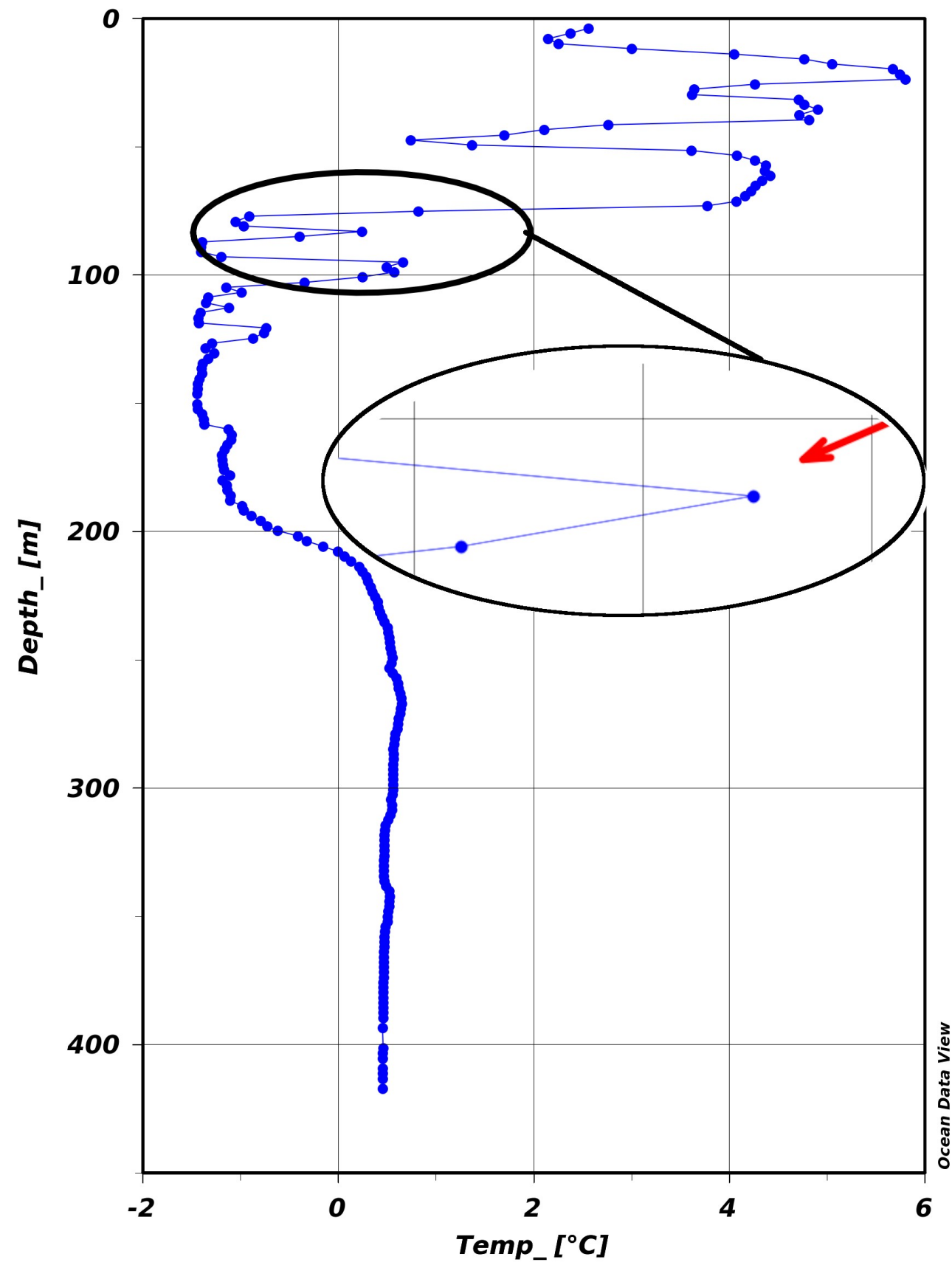
.csv (comma separated)

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The input data

```
smieruch@bgeo04l004: ~/Downloads/UDASH_test_subset
File Edit Options Buffers Tools Help
Prof_no,Type,year,month,Longitude_[deg],Latitude_[deg],Pressure_[dbar],Depth_[m],Temp_[°C],Salinity_[psu]
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-UUU:----F1  UDASH_test_subset.csv  Top (1,0)  (Fundamental) -----
```

The flags: spike & suspect gradient



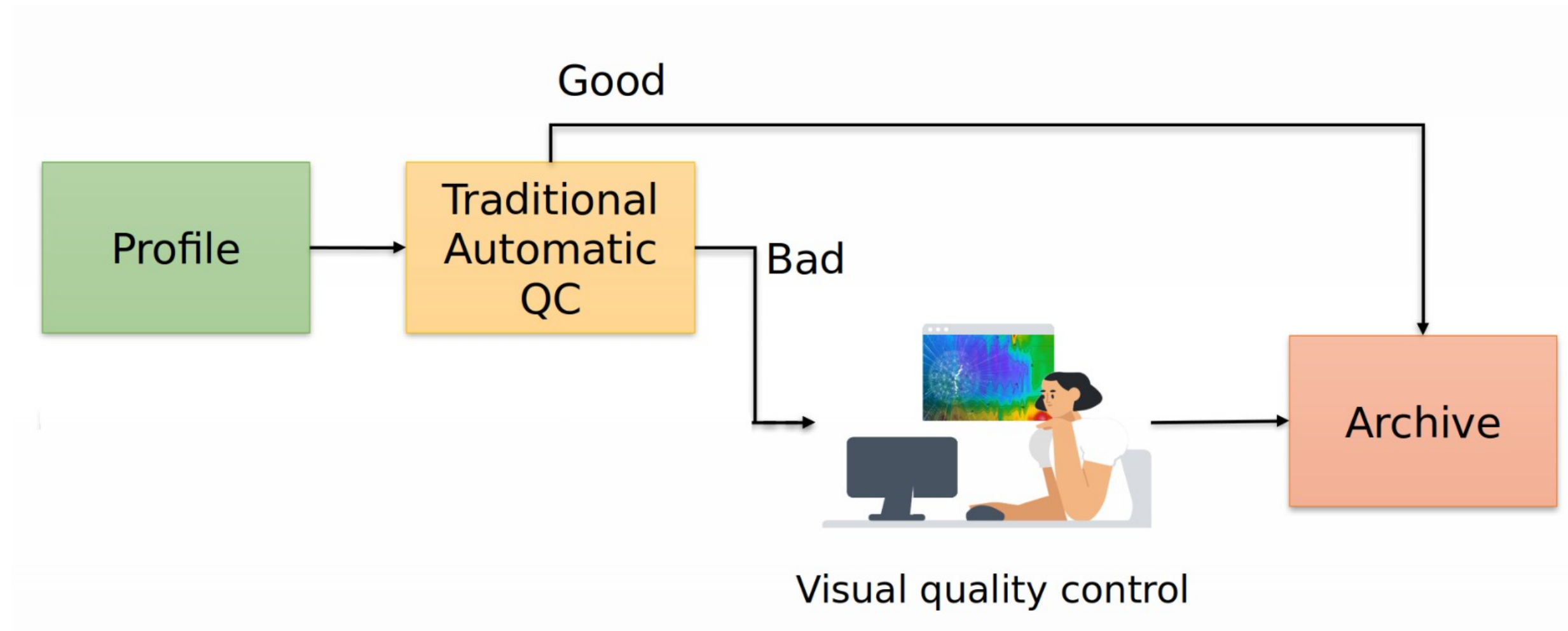
The output data

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smieruch@bgeo04l004: ~/Downloads/UDASH_test_subset
File Edit Options Buffers Tools Help
Prof_no,Type,year,month,Longitude_[deg],Latitude_[deg],Pressure_[dbar],Depth_[m],Temp_[°C],Salinity_[psu],Trad_QF,ML_QF
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-UUU:----F1  UDASH_test_subset_processed_full.csv  Top (1,0)  (Fundamental) -----
```

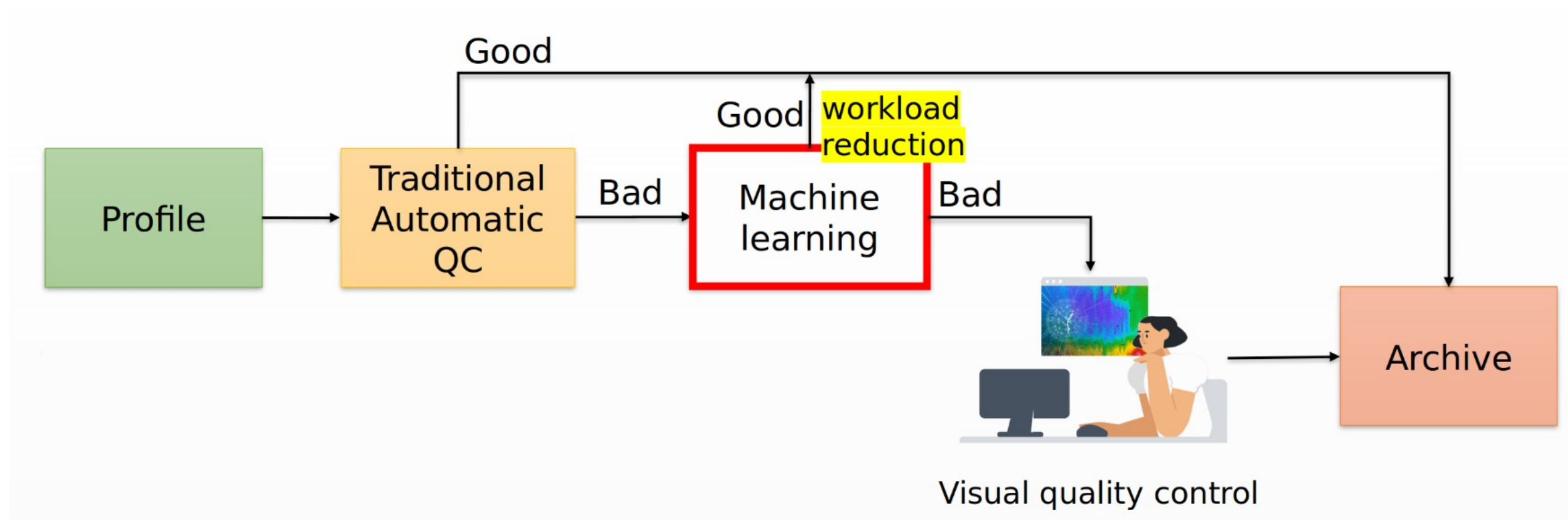

The AI

```
smieruch@bgeo04l004: ~/Downloads/UDASH_test_subset
File Edit Options Buffers Tools Isearch Help
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-UUU:----F1 UDASH_test_subset_processed_full.csv 62% (41137,0) (Fundamental Isearch) -----
```

The classical approach



The classical + AI approach



The evaluation

Classic checks:

TP=1,229,357	FP=335
FN=2,443	TN=2,595

Classic + AI checks:

TP=1,231,439	FP=339
FN=361	TN=2,591

preliminary

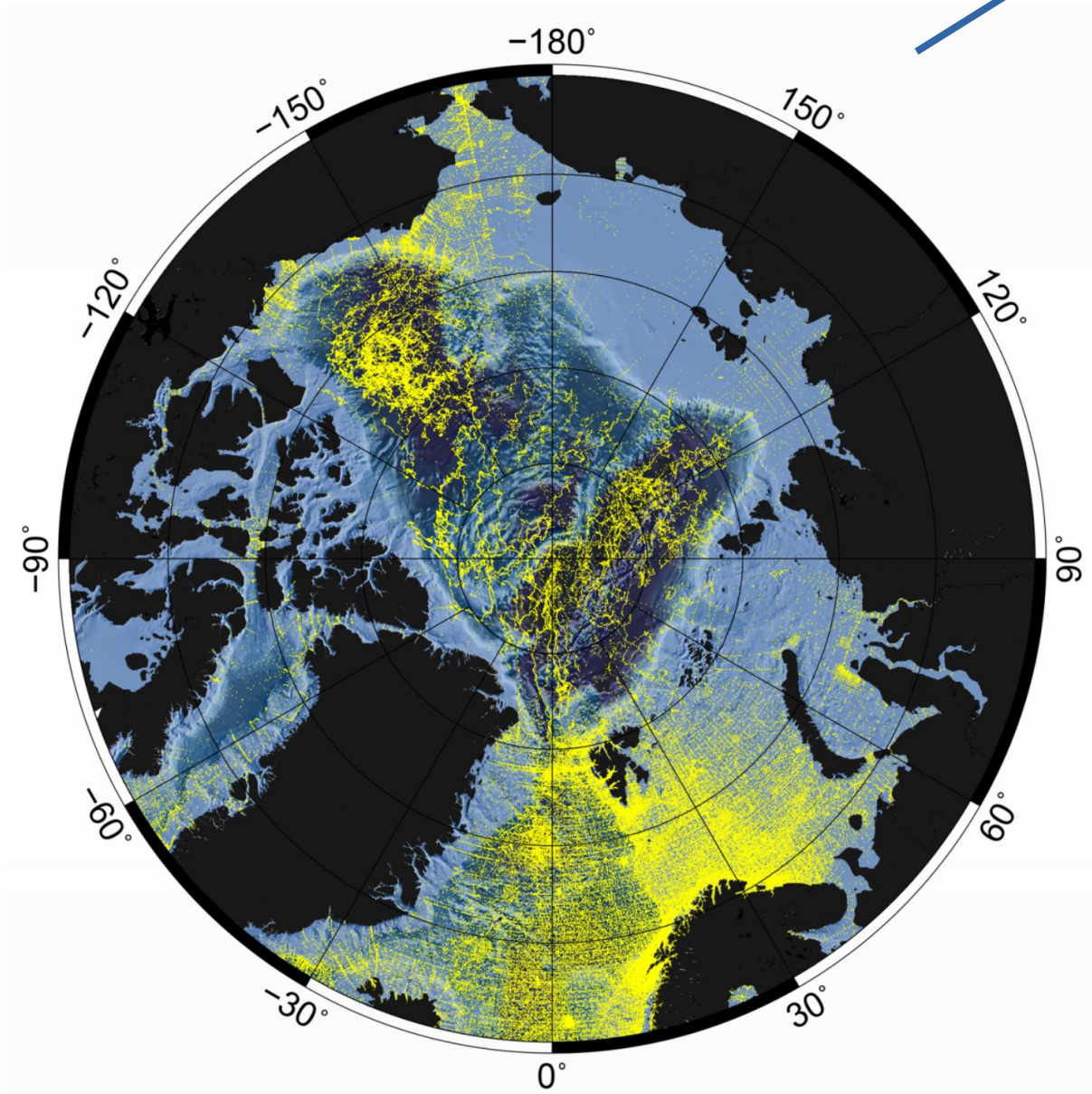
How we did it

AI – training, validation, evaluation

UDASH (Unified Database for Arctic and Subarctic Hydrography)
<https://doi.pangaea.de/10.1594/PANGAEA.872931>

280,000 temperature and salinity profiles

Visually controlled by human expert



Classical QC checks

```

# Outliers in mixed layer
# =====
def Traditional_outlier_detection(Data):
    gradient = T_Suspect_gradient_T_D(Data)
    Data['gradient2'] = np.array(gradient)
    data1 = Data.loc[(Data['gradient2'] >= 0.5) & (Data['Depth_m'] <= 100)]
    data1.loc[:, 'QF_trad'] = 4
    return data1
def T_Suspect_gradient_T_D(Data):
    unique_profil = Data['Prof_no'].unique()
    d_grad = []
    data2 = []
    for j in range(len(unique_profil)):
        profil = Data[Data['Prof_no'] == unique_profil[j]].reset_index(drop=True)
        # data2 = pd.concat([data2, profil])
        data2.append(profil.values)
        t = profil['Temp [°C]'].values
        d = profil['Depth [m]'].values
        i = 0
        grad = [-999]
        while i < d.size - 1:
            # case of -999 in temperature
            if -999 in (t[i], t[i+1], d[i+1], d[i]):
                grad = np.append(grad, -999) # give this value 1000
            else:
                if (d[i+1] - d[i]) != 0:
                    grad = np.append(grad, (t[i+1] - t[i]) / (d[i+1] - d[i]))
                else:
                    grad = np.append(grad, -999) # give this value 1000
                i += 1
            # grad = np.append(grad, grad[-1])
            d_grad.append(grad)
        d_grad_flat = [item for sublist in d_grad for item in sublist]
    return np.array(d_grad_flat)
# =====

```

MLP (Multi-Layer-Perceptron)

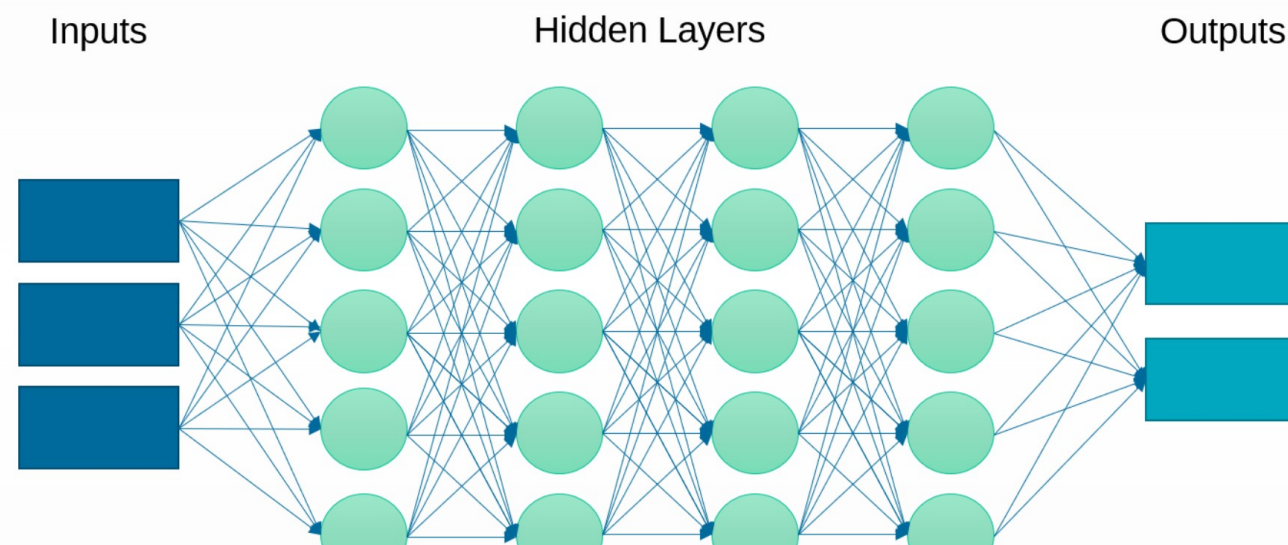
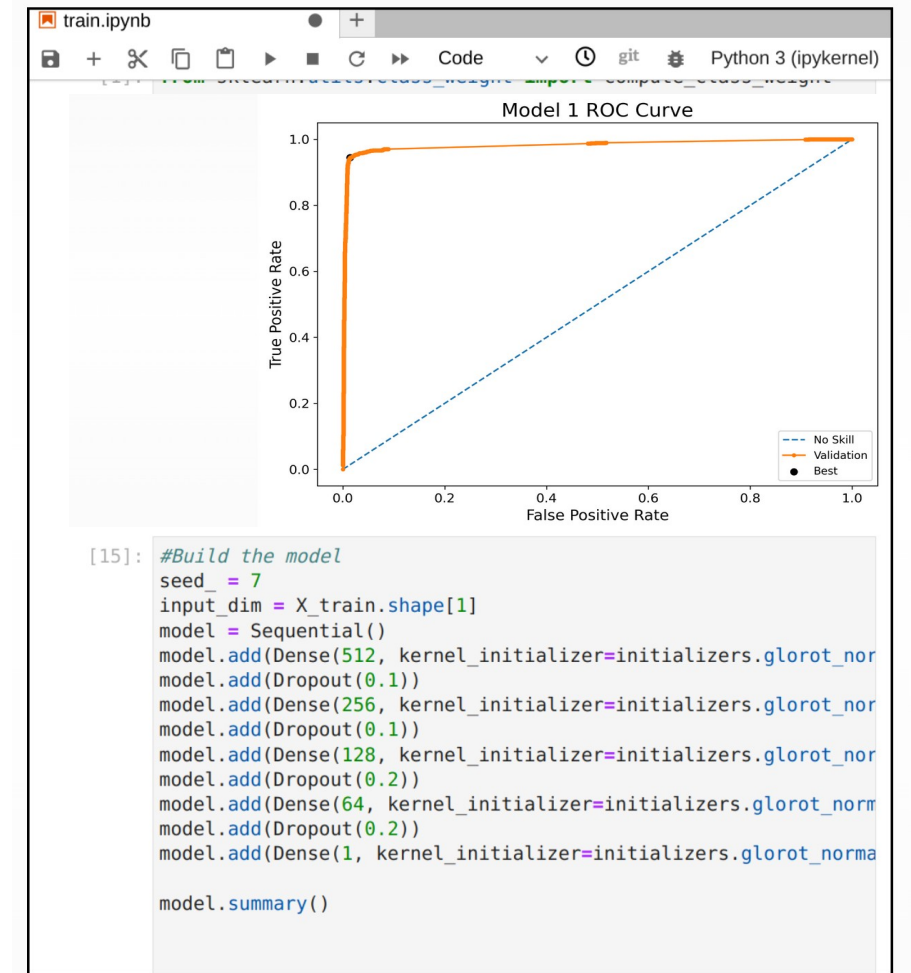
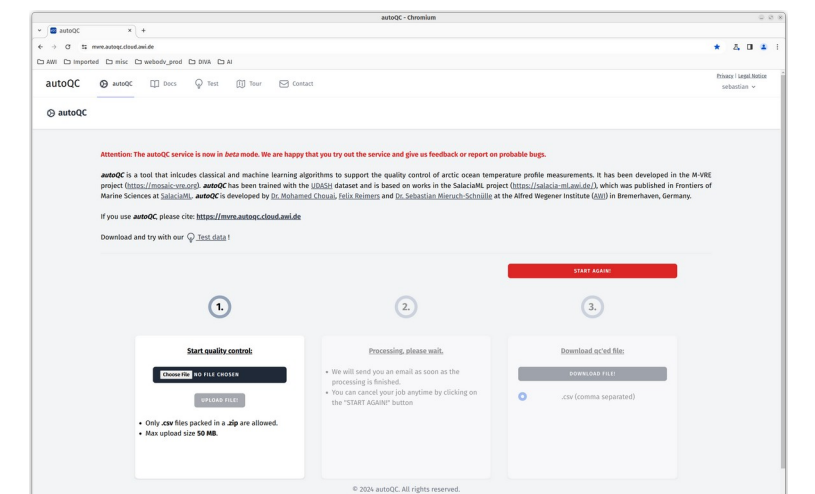


Figure from [http://utpedia.utp.edu.my/id/eprint/24149/1/Sketch Recognition based on Deep Learning.pdf](http://utpedia.utp.edu.my/id/eprint/24149/1/Sketch%20Recognition%20based%20on%20Deep%20Learning.pdf)



App



Future

- Mature and finalize
- GitHub: <https://github.com/mchouai27/SalaciaML-Arctic>
- Apply on salinity
- Improve algorithms
- Approach communities, e.g. SeaDataNet, IQuOD, ...
- Develop model for other error: statistical screening
- Use other datasets (from other qc-operators)
- ...

27-29 May 2024 

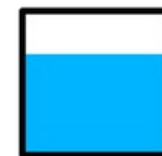


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International conference on Marine Data and Information Systems



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