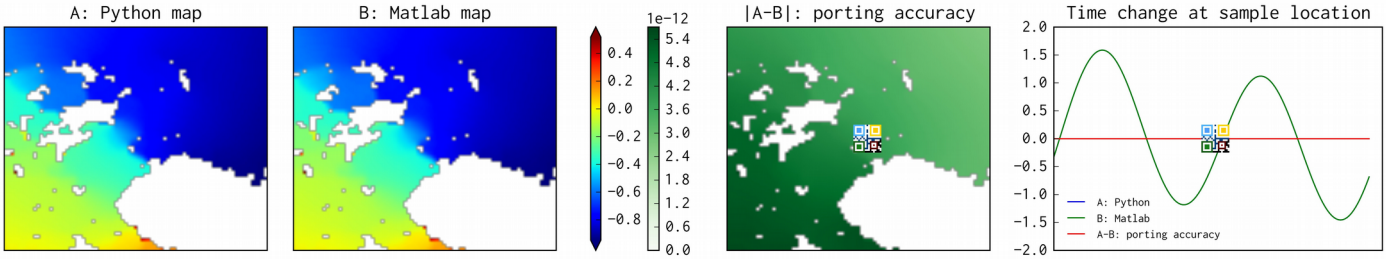
Porting hydrodynamic software from MATLAB® into Python

Waterbeweging | Watermotion translated the client's **MATLAB®** code for scientific computing into **Python**, the open-source programming language | Well-developed analytical skills, a high level of computer literacy and eye for detail made this assignment a successful project | In the client's words

> *Watermotion can provide clear code for complex algorithms [] Thanks to its development skills and proficiency with programming languages, the new code perfectly substitutes the old one [] Watermotion was willing to think along with us to deliver a product suiting our present and future needs at its best*

The client's software deals with information on tidal motion that varies in time and space. Thanks to **Watermotion**'s collaboration, the **Python** code precisely produces the same output as **MATLAB®**. The round-off error purely depends on the computing machine and is in the order of 10^{-12}. Just a thousandth of a billionth!



Left The three maps show results for the same moment in time calculated with the product Python code (A), with the given MATLAB® code (B) and their difference (B-A) *Right* The curves show that accuracy is also preserved over time at individual points in space. (Figures drawn with **matplotlib**, Python's own plotting library.)

#1 / Python is an attractive alternative to MATLAB® for handling quantitative information

Open-source developments such as Python are valued for their accessibility and economicity

Thanks to complete and reliable libraries for scientific applications, *Python* is increasingly adopted to write crisp tools for pre- and post-processing and for customizing software packages

The Python code produced by *Watermotion* met the client's requirements for ***accuracy*** (#2), ***clarity*** (#3) and ***implementability*** (#4)

#2 / The code in Python works out the maths of the original code just as accurately

To harvest the benefits of *Python* at no penalty, the new calculations need be *exactly* the same as the old ones for a variety of input

So can archived projects be reproduced, for example

And only after results equality is achieved can possible improvements be safely applied to the new code

Both spatial and temporal accuracies are on display above

#3 / The product code is plain to read, interpret and develop further

Watermotion's code is precisely *documented*. The user can recognise clearly how each piece of algorithm leads from input to output

Readability is ensured by adhering strictly to style guidelines. A *user's guide* was also provided

Also, the product code is already *future-ready* to work seamlessly with both version 2 and 3 of Python, sparing ahead of time the bother of adapting it

#4 / The product code solves for all intricacies under the hood

Finally, Watermotion's code in Python ensures a *lean, unified implementation* for many applications

By drawing from *object-oriented programming* principles, the Python code can be included in *scripts* to produce project-specific information, launch routine jobs in batch mode or add new features as the need be

Custom input formats are also automatically handled with

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