

“New” types of computers

Lower precision, parallel computations

GPU - Graphs processing unit

- Massively parallel.
- Used for machine learning, where high precision is often unnecessary.
- Support half-precision floats.

FPGA - Field programmable gate arrays

- Programming at a logic gate level (very hard).
- Configure a chip to solve only your equations (very power efficient).
- Can use arbitrary numerical precisions (not just double, single, half).
- Now available on cloud computing, e.g. Amazon, Microsoft.

Can we take advantage of these developments?

Things to consider

Precision of input

How accurate are our observations?

Satellites can measure sea surface temperature with an uncertainty of 0.3 °C and surface wind with an uncertainty of 1 m/s.

- Remote Sensing of European Seas - V.Barale, M.Gad

Precision of algorithm

How do errors grow through different computations?

Known for small algorithmic components but not
in combination.

How big are model uncertainties/inaccuracies?

Stochastic components used to increase spread.

Precision of output

How accurate do we want our answer?

e.g. Temperature in Exeter:

Double precision: 7.8902349472045898°C

Single precision: 7.89023495°C

Half precision: 7.890625°C