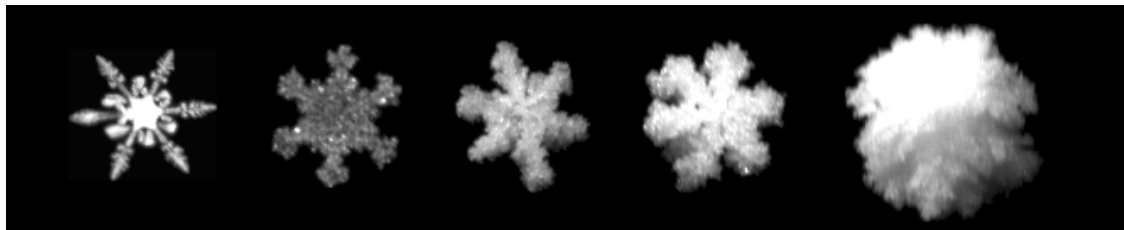


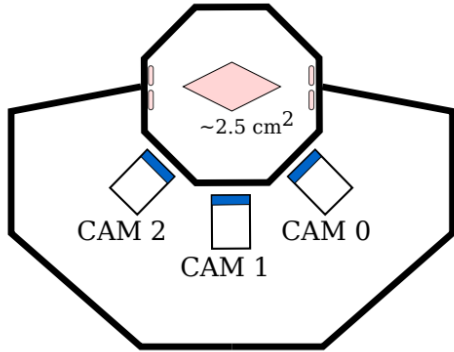
MASCDB, a database of images, descriptors and microphysical properties of individual snowflakes in free fall

Jacopo Grazioli, Gionata Ghiggi, Anne-Claire Billault-Roux, **Alexis Berne**

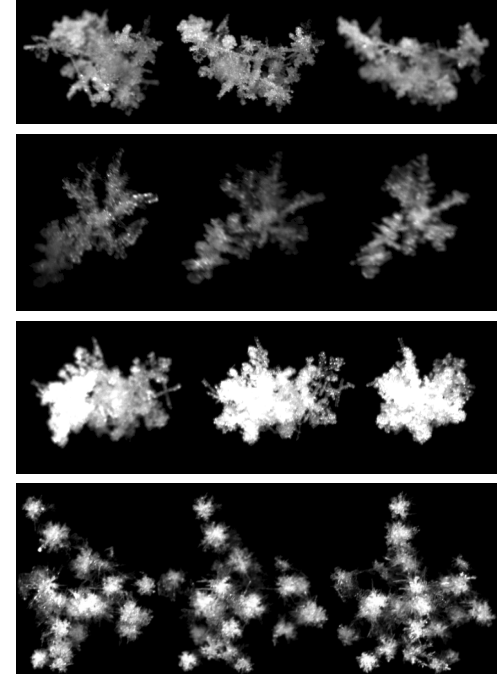
Environmental Remote Sensing Laboratory (LTE)
EPFL, Lausanne, Switzerland



The Multi-Angle Snowflake Camera (MASC)



- 3 co-planar pictures
- 33.5 μm pixel size
- 5 MP (2448x2048)
- Area $\sim 2.5 \text{ cm}^2$
- $\sim 2 \text{ Hz}$ acquisition



Observations of snowflakes before ground deposition

Collected data

10 campaigns conducted around the world between 2015 and 2022

Korea / ICEPOP 2018



ICE GENESIS 2021 (CH)



Antarctica / APRES3 2015



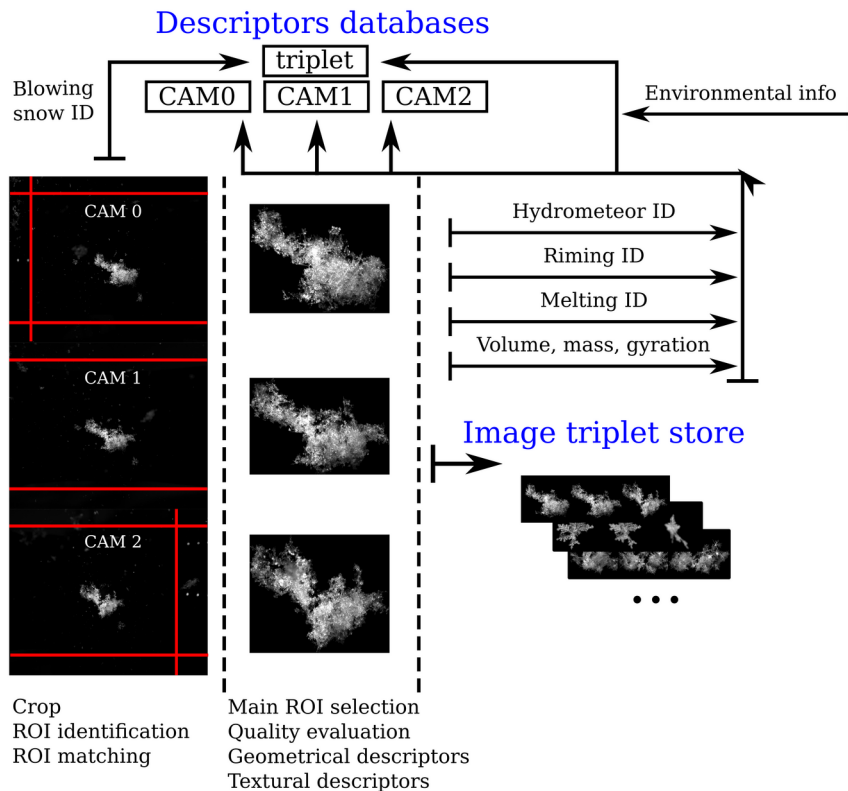
Davos 2015 (CH)



Valais 2016 (CH)



MASC image processing



850k snowflakes
2'550k images (triple view)

Individual images CAM0-2
Geometrical/textural descriptors
Retrievals from individual views

Triplet

Retrievals from multiple views
(hydrometeor, riming, melting, mass)

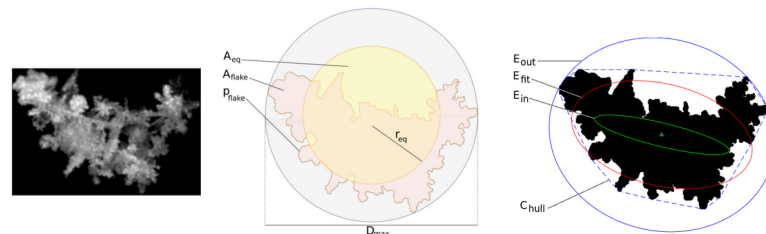
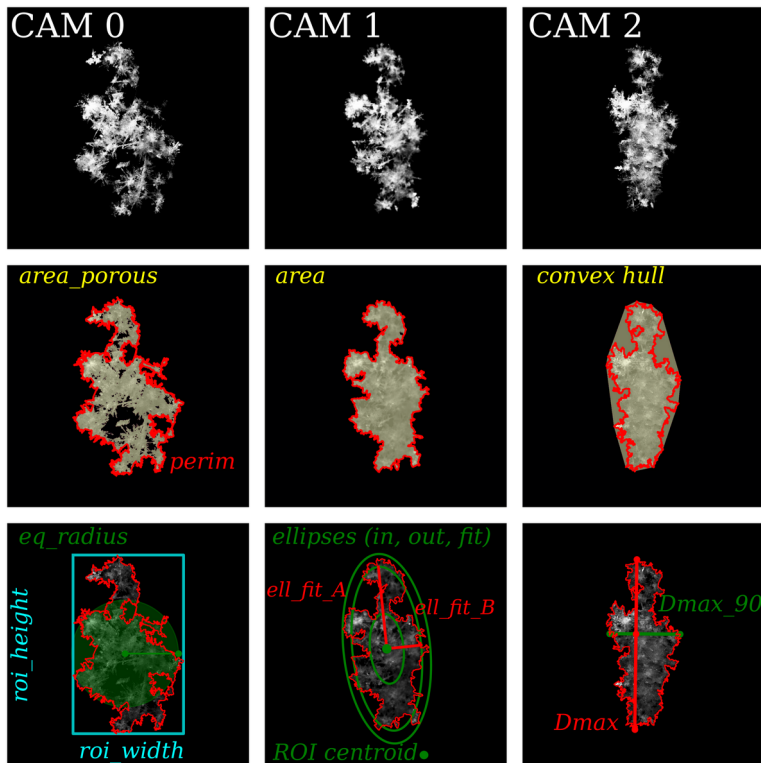
Image triplet stored

Gray-scale images CAM0, CAM1, CAM2

Cropped & centered on common grid

Grazioli et al, Scientific Data, 2022

Database content



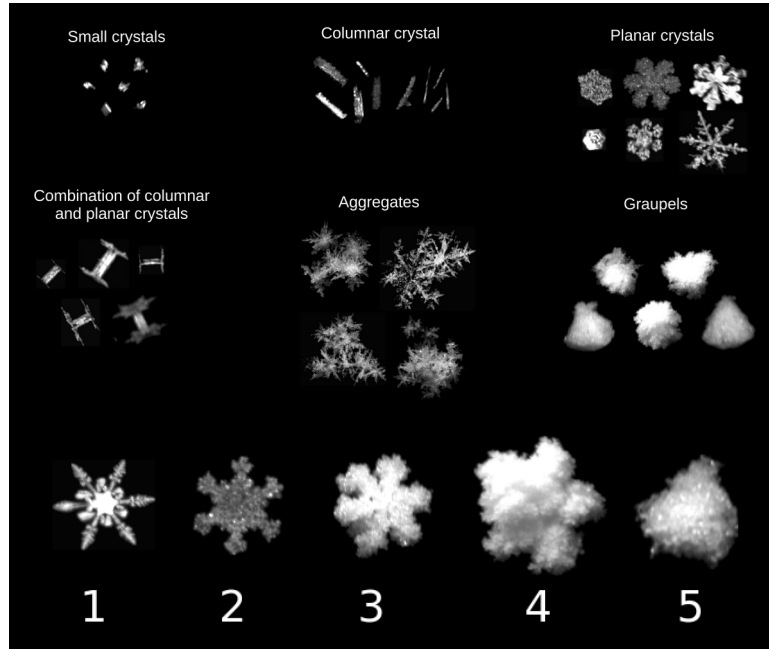
~ 70 pre-computed descriptors (3x)

- Geometry, size, complexity...
- Textural information
- Image quality
- Shape approximation / orientation

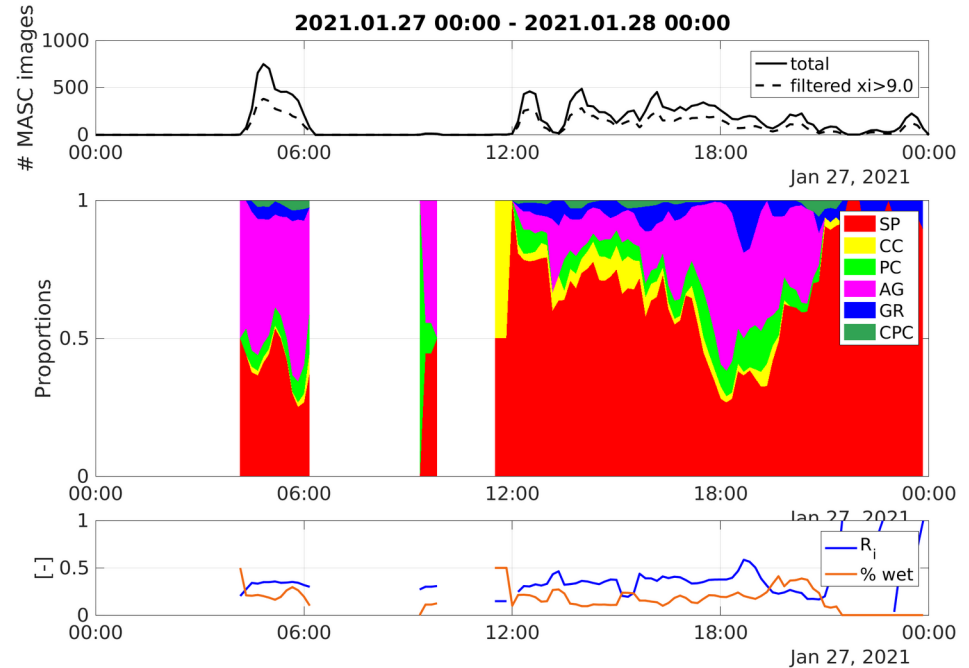
Grazioli et al, Scientific Data, 2022

Database content

Classification / Riming degree

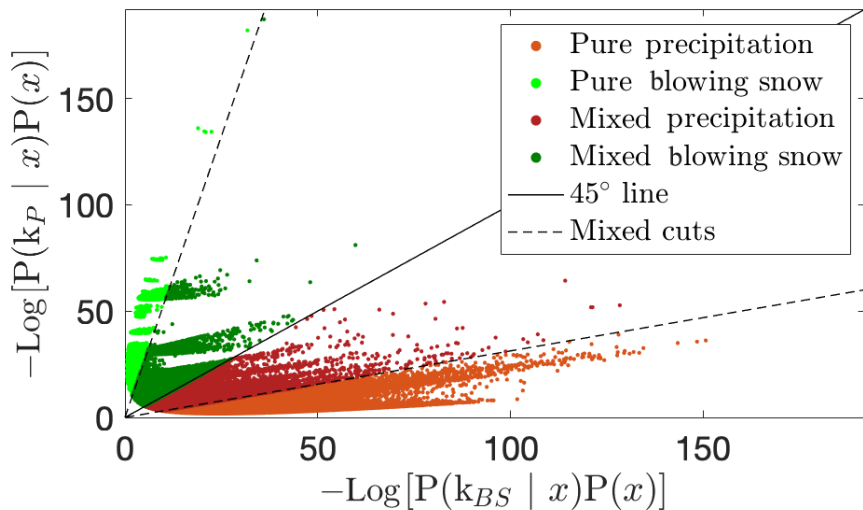


Praz et al. (2017)



Database content

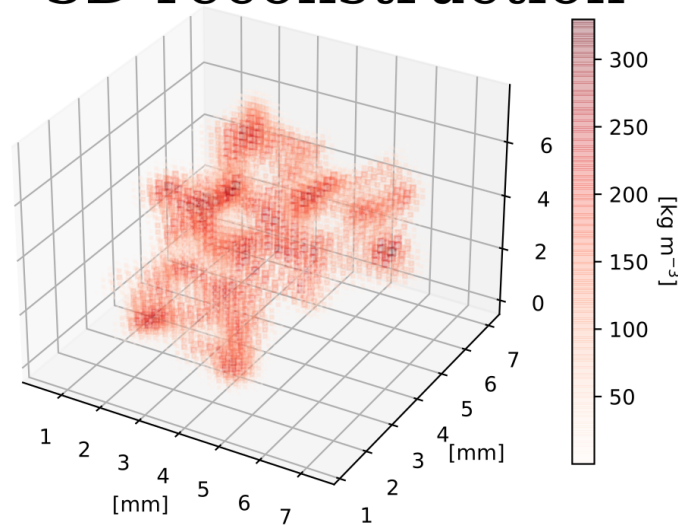
Blowing snow detection



Schaer et al, 2020

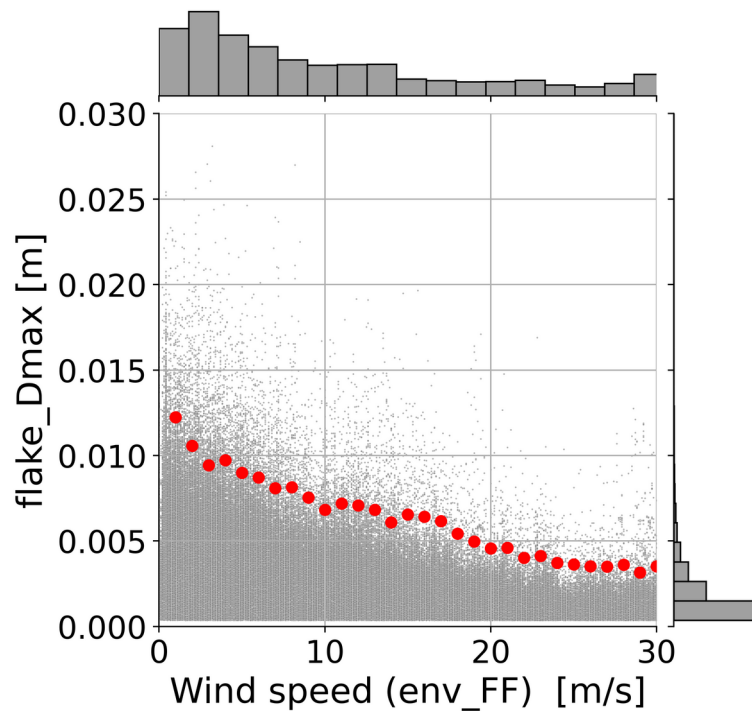
Mass + volume estimation

3D reconstruction

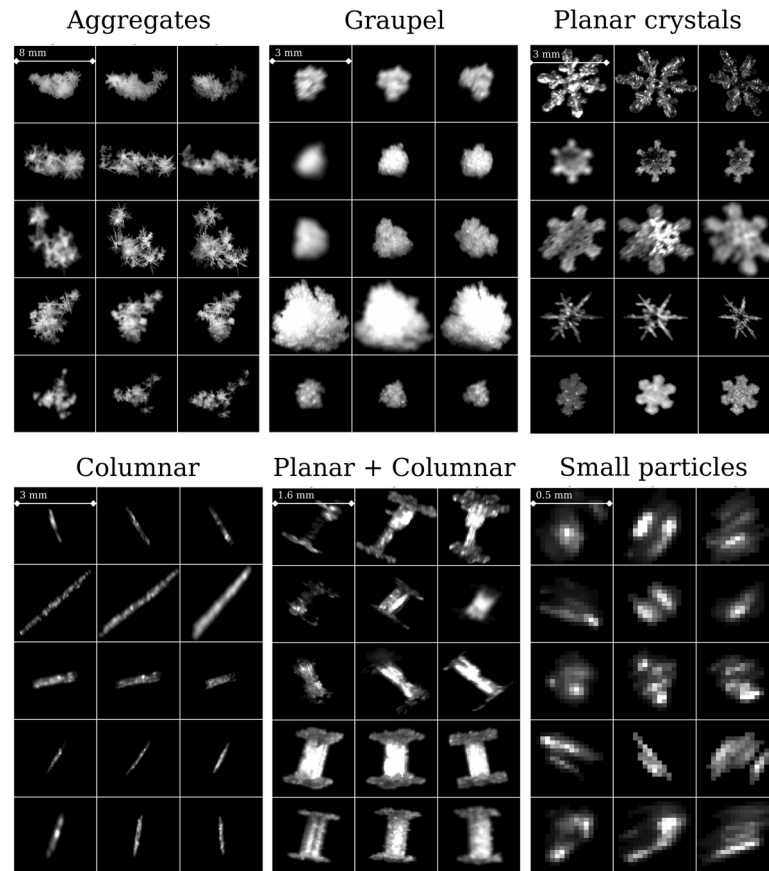


Leinonen et al. (2021)

Environmental Information



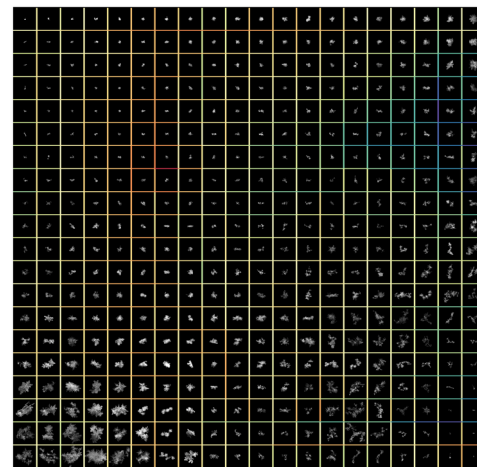
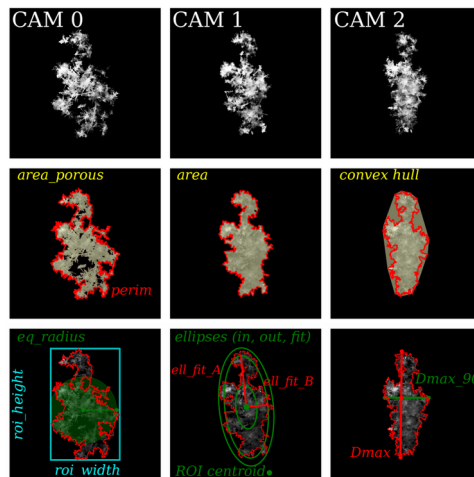
Gray-scale Images



MASCDB for the community

- Unique, **large**, geographically diverse **dataset** of snow particles
- **Standardized** and coherent **pre-processing**
- Includes **pre-computed** / “**pre cooked**” retrievals
- Includes co-located **environmental information**
- A python package (*pymascdb*) is provided!

Thank you for your attention



Paper: <https://www.nature.com/articles/s41597-022-01269-7>

Database: <https://doi.org/10.5281/zenodo.5578920>

Code: <https://github.com/ltelab/pymascdb>

Documentation: <https://pymascdb.readthedocs.io/en/latest/index.html>