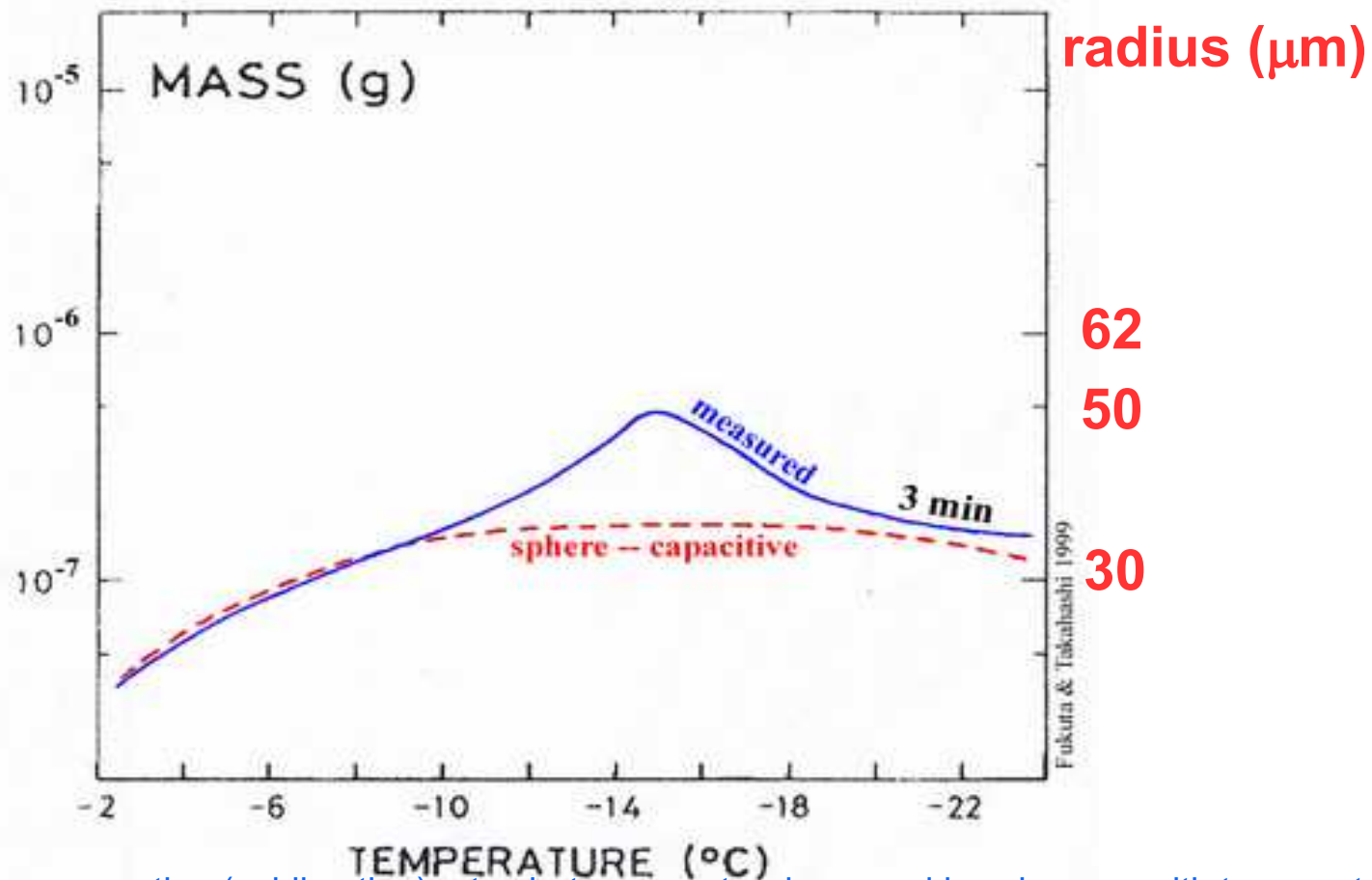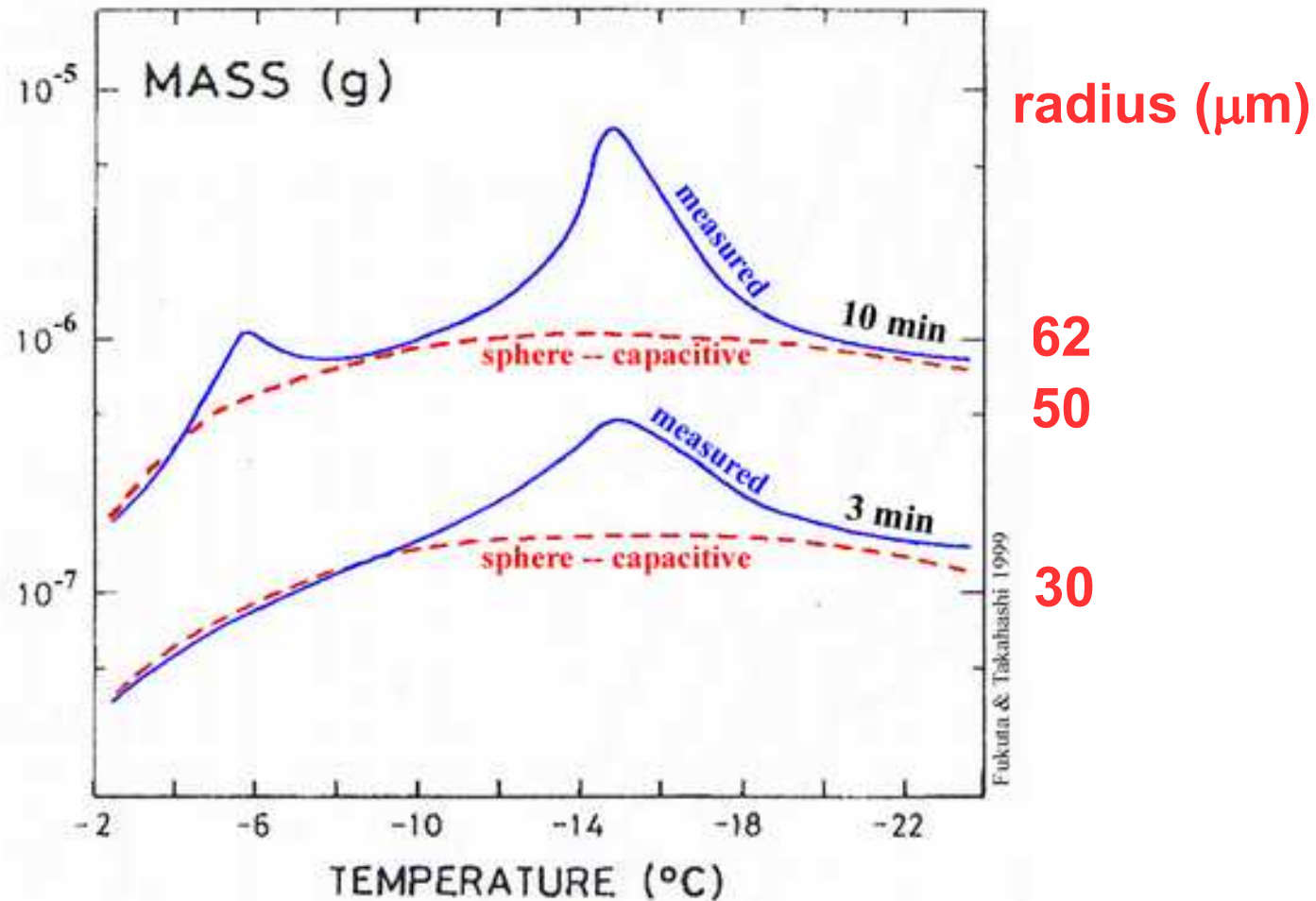# How fast does snow grow?

Notes: This difference in evaporation (sublimation) rates between water drops and ice changes with temperature. It is zero at 0 C, increases as the temperature decreases until about -12 C, then slowly decreases again. If the crystals are spheres, then the predicted mass after 3 minutes (starting with a 10 μm diameter drop) is predicted to be the red dashed curve.

Instead, we measure the blue curve. Something different is happening between about -10 and -20 C.
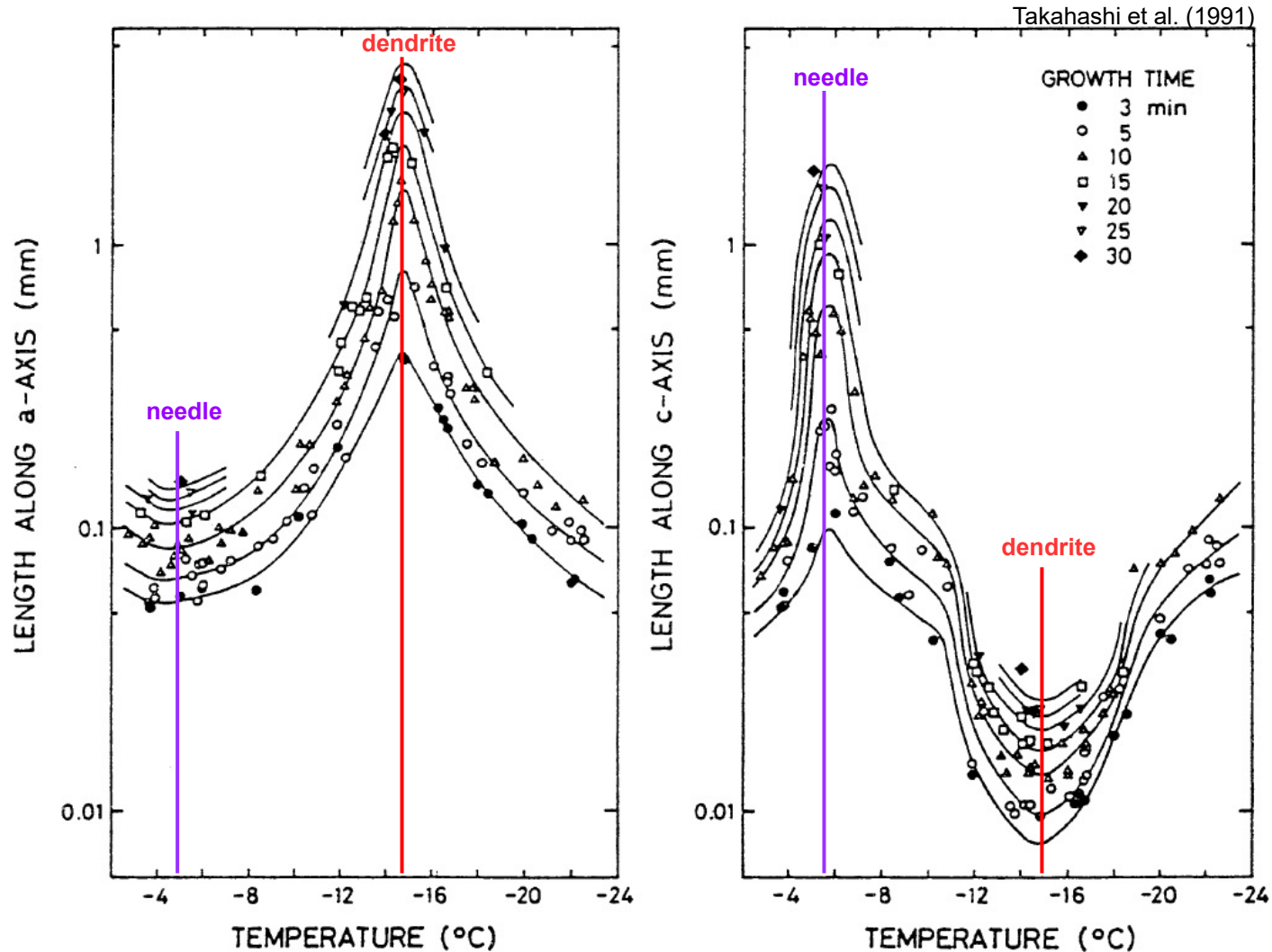
How fast does snow grow (II)?

Notes: After 10 minutes, we see another temperature region where the actual growth is faster, between about -4 and -8 C.

What is happening here?

How fast does snow grow (III)?

Takahashi et al. (1991)
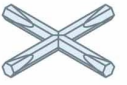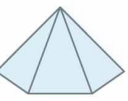
Notes: The answer is: the crystals are becoming very non-sphere-like at those temperatures. Near -6 C, long, narrow needle crystals form; and near -15 C, thin, flat star-like "dendrites" form. The "length along a-axis" is the diameter of the needle or star, the "length along c-axis" is the thickness in the other direction. In both cases, over 1 mm in 30 minutes.
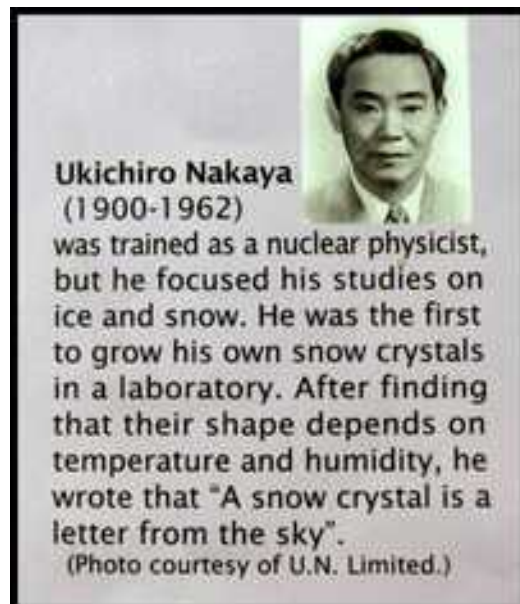
What are the different snow shapes?

1) Columnar forms*

C1a	C1b	C1c	C2a	C2b	C2c	C3a	C3b	C3c

C3d	C3e	C4a	C4b	C4c	C4d
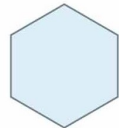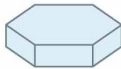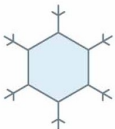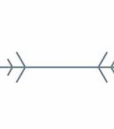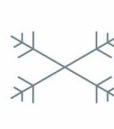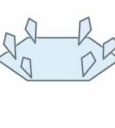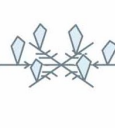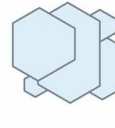
*Symbol system based on Nakaya's original system

Ukichiro Nakaya (1900-1962) was trained as a nuclear physicist, but he focused his studies on ice and snow. He was the first to grow his own snow crystals in a laboratory. After finding that their shape depends on temperature and humidity, he wrote that "A snow crystal is a letter from the sky". (Photo courtesy of U.N. Limited.)

Notes: Here are those needle-like shapes. The ones in the top row are relatively common, as seen on the ground in mid-latitutes.

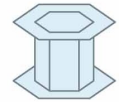# What are the different snow shapes?

2) Planar (tabular) forms
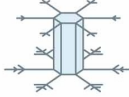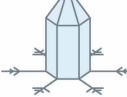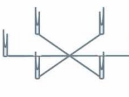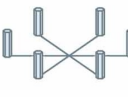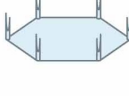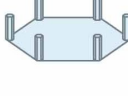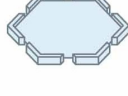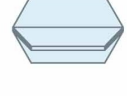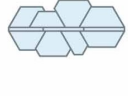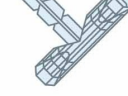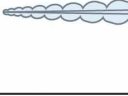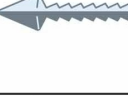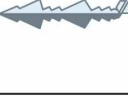
Notes: And here are the more dendrite-like shapes. The P2 to P4 are probably more commonly found. P5 types are thought to come about from the breaking apart of a P2-P4 type. The breaking may happen when crystals collide.
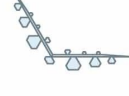
What are the different snow shapes?

3) Columnar-planar (combo) forms