Hydrometeor Classfication Method

Hydrometeor Classification (1)

●Membership Functions (MBFs)

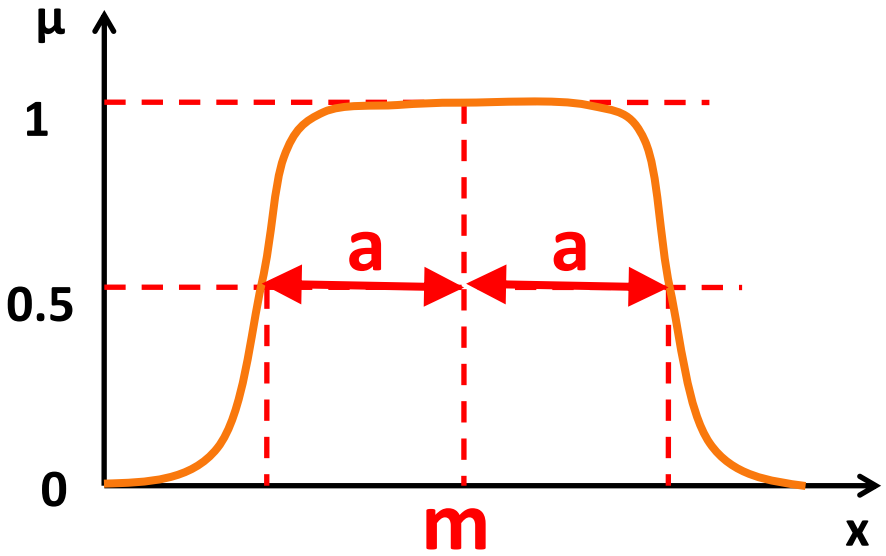
We use **Beta functions** as MBFs.

$$\mu_{ij}(x_i) = \frac{1}{1 + \left[\left(\frac{x_i - m_{ij}}{a_{ij}}\right)^2\right]^{b_{ij}}}$$

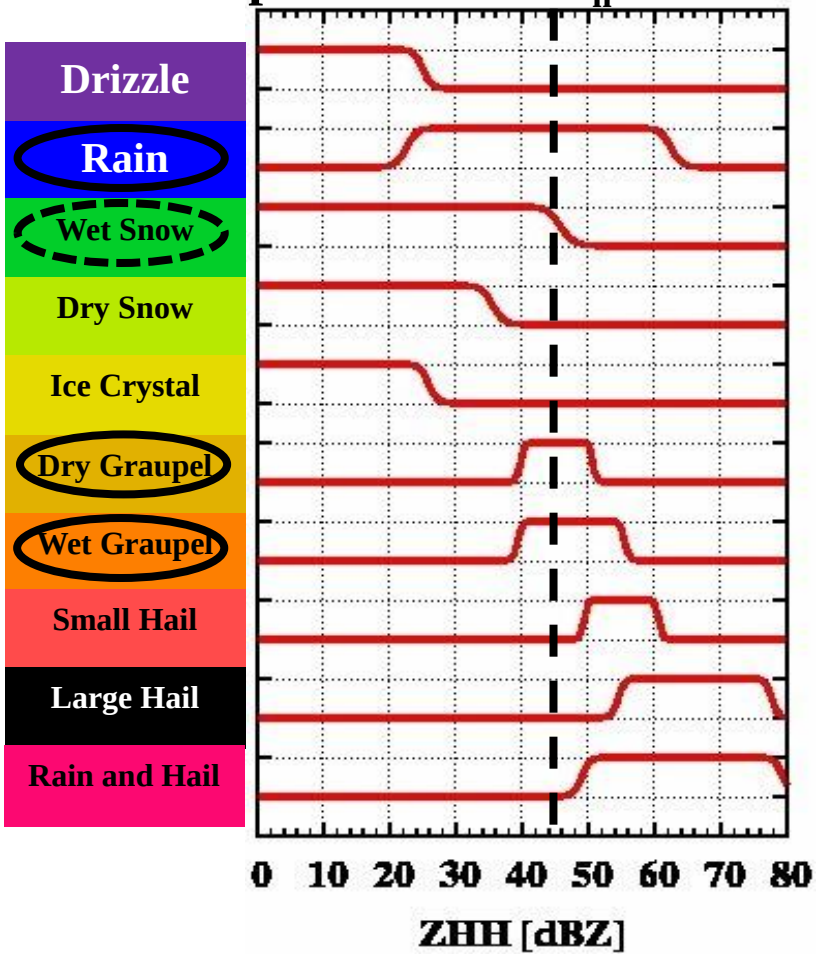
i : observational parameters (Z_h, Z_{dr}, K_{dp}, ρ_{hv}, T)

J : hydrometeor types(Drizzle, Rain, ・・・)

x_i : the values of observational parameters **i**



Example: MBFs of Z_h



In the same way, MBFs are made for Z_{dr}, K_{dp}, ρ_{hv} and T.

Hydrometeor Classification (2)

●Determination of Hydrometeor Type

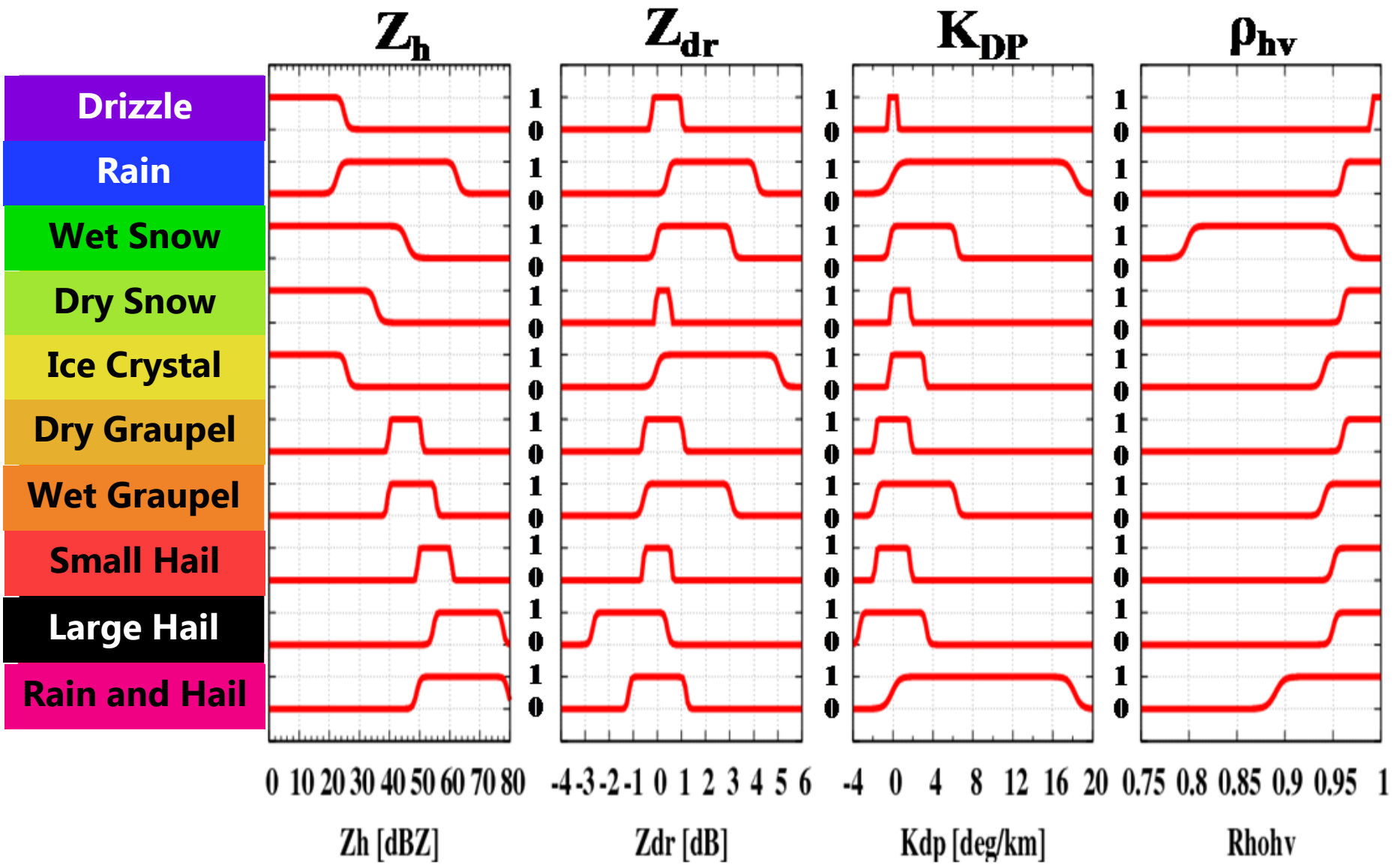
We evaluate probability of each hydrometeor type with **rule strength**.

$$RS_j = \prod_i \mu_{ij}(x_i)$$

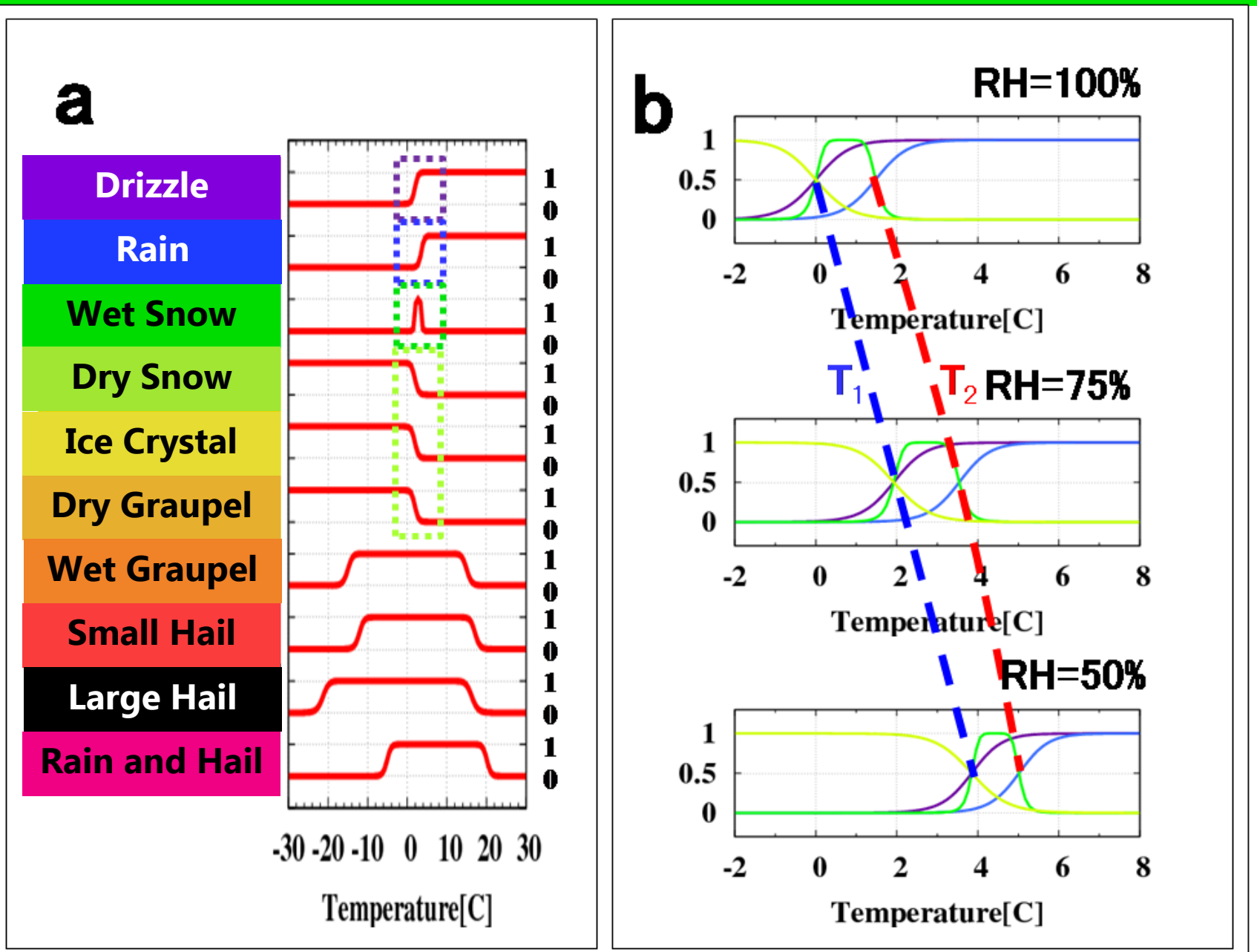
i : observational parameters(Z_h, Z_{dr}, K_{dp}, ρ_{hv}, T)
j : hydrometeor types(Drizzle, Rain, ・・・)
$\mathbf{x_i}$: the values of observational parameters **i**
$\boldsymbol{\mu_{ij}}$: the value of MBFs for $\mathbf{x_i}$

If the rule strength of **a hydrometeor type j** is the **largest** among all, **the hydrometeor type** is identified as **the most probable hydrometeor type** at the grid point.

MBFs of Polarimetric Parameters



MBFs of Polarimetric Parameters



MBFs of Polarimetric Parameters

- temperature that snow begin to melt

$$T = 0.07(100 - RH)$$

(approximated from Matsuo and Sasyo, 1981)

- temperature that snow completely melt

$$T = 7 - \left(\frac{RH}{40}\right)^2$$

(approximated from Matsuo and Sasyo, 1981)