Fig.1 the influence of scale parameter on LR
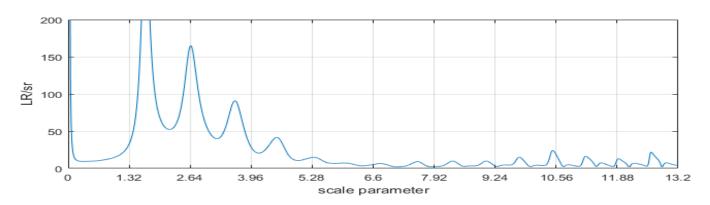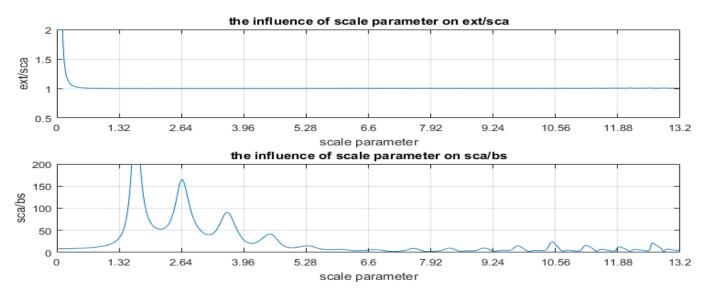

Fig.2 the influence of scale parameter on the two parameter

Conclusion:

When the scale parameter is greater than 0.6, the value of LR increases first and then decreases with the increasing scale parameter, and there are several extremums.

Table.1   LR of several single aerosol particle under 532nm

Type of Particle	complex refractive index	LR	$\dfrac{ext}{sca}$	$\dfrac{sca}{bs}$
water	$1.333+1.96*10^{-9}i$	63.5	1	63.5071
ice	$1.311+3.11*10^{-9}i$	63.4	1	63.4086
marine aerosol	$1.381+4.26*10^{-9}i$	63.7	1	63.7364
sulfide	$1.43+10^{-8}i$	64	1	63.9919
meteor	$1.513+2.64*10^{-4}i$	65	1.0076	64.4777
mineral	$1.53+0.0055i$	74.2	1.1491	64.5992
water soluble aerosol	$1.53+0.006i$	78.6	1.2168	64.6056
ash	$1.5+0.008i$	76.5817	1.2438	64.4168
dust	$1.53+0.008i$	78.6	1.2168	64.6056
soot	$1.750+0.44i$	356.3	5.3585	66.4946

Conclusion:

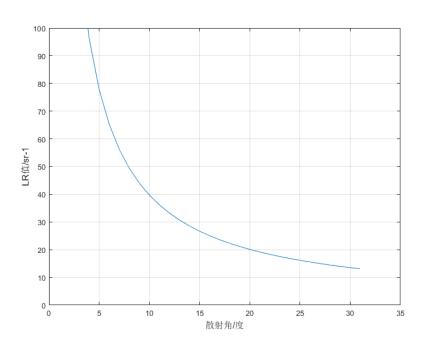The value of LR decreases with the increasing imaginary part of the complex refractive index

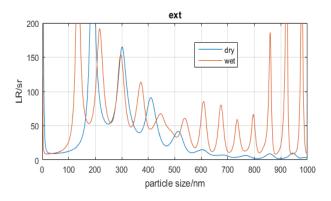Fig.4 the influence of field angle on LR

Conclusion:

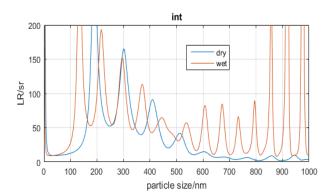The value of LR increases with the increasing filed angle.

A three-component optical equilibrium spherical aerosol model is assumed to study the influence of different mixing states on optical parameters of aerosol clusters.

    1:**External mixing**.

    2:**internal mixing**.

    3: **Core-shell internal mixing**.

Table.2　Refractive index of different Mixing state

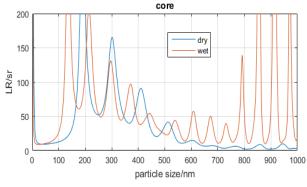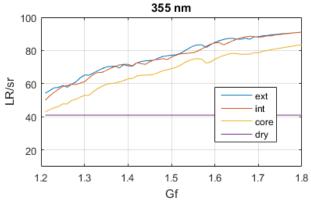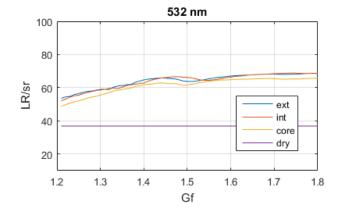| Mixing state		m
Ext	Ec	m_{ec}
	Nonabs	$\dfrac{m_{nonabs} * f_{nonabs} + m_{water} * f_{water}}{f_{nonabs} + f_{water}}$
int		$m_{ec} * f_{ec} + m_{nonabs} * f_{nonabs} + m_{water} * f_{water}$
core	Core	m_{ec}
	shell	$\dfrac{m_{nonabs} * f_{nonabs} + m_{water} * f_{water}}{f_{nonabs} + f_{water}}$

Fig.5 LR in different situation

Conclusion:

when the mixing states of aerosol are complete external mixture, complete uniform internal mixture and complete coated mixture, the value of LR appears to be: complete uniform internal mixture > complete external mixture > complete coated mixture.
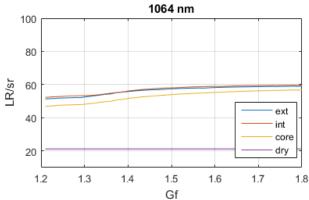
Fig.6 LR under different wavelength and GF

Conclusion:

1. For one particle that PNSD is a constant. The longer incident wavelength is, the LR of Dry aerosol is.

2. The value of LR will increase after hygroscopic growing, but it still follows the law that: complete uniform internal mixture > complete external mixture > complete coated mixture