Table 1. A contrast between QAA_v4 and QAA_v5

	$r_{}(\lambda) = R_{}(\lambda)/(0$	$52 + 1.7 R_{rs}(\lambda)$
$u = b_b/(a+b_b)$	$r_{rs}(\lambda) = R_{rs}(\lambda)/(0.52 + 1.7 R_{rs}(\lambda))$ $r_{rs}(\lambda) = (g_0 + g_1 u(\lambda))u(\lambda)$ $u(\lambda) = \frac{-g_0 + \sqrt{(g_0)^2 + 4g_1 * r_{rs}(\lambda)}}{2g_1}; g_0=0.089, g_1=0.125$	
7 - 550 550	QAA_v5	QAA_v4
$\lambda_0 = 550; 555; 560$	$\chi = \log \left(\frac{r_{rs}(443) + r_{rs}(490)}{r_{rs}(\lambda_0) + 5 \frac{r_{rs}(667)}{r_{rs}(490)} r_{rs}(667)} \right),$	$\chi = \log \left(\frac{r_{rs}(443) + r_{rs}(490)}{r_{rs}(\lambda_0) + 2\frac{r_{rs}(640)}{r_{rs}(490)} r_{rs}(640)} \right)$
Exponent of $b_{bp}(\lambda)$	$a(\lambda_0) = a_w(\lambda_0) + 10^{-1.146 - 1.366 \chi - 0.469 \chi^2}$ $\eta = 2.0 \left(1 - 1.2 \exp\left(-0.9 \frac{r_{rs}(443)}{r_{rs}(\lambda_0)}\right) \right)$	$a(\lambda_0) = a_w(\lambda_0) + 10^{h0 + h1\chi + h2\chi^2}$ $\eta = 2.2 \left(1 - 1.2 \exp\left(-0.9 \frac{r_{rs}(443)}{r_{rs}(555)} \right) \right)$
ζ : $a_{\rm ph}411/a_{\rm ph}443$	$\zeta = 0.74 + \frac{0.2}{0.8 + r_{rs}(443) / r_{rs}(\lambda_0)}$	$\zeta = 0.71 + \frac{0.06}{0.8 + r_{rs}(443)/r_{rs}(555)}$
ξ: a _{dg} 411/a _{dg} 443	$\xi = e^{S(443-411)},$ $S = 0.015 + \frac{0.002}{0.6 + r_{rs}(443) / r_{rs}(\lambda_0)}$	$\xi = e^{S(443-411)},$ $S = 0.015$
Upper limit for R _{rs} (667)	$R_{rs}(667) = 20.0(R_{rs}(\lambda_0))^{1.5}$	$R_{rs}(640) = 0.01R_{rs}(555) +$
Lower limit for R _{rs} (667)	$R_{rs}(667) = 0.9(R_{rs}(\lambda_0))^{1.7}$	$1.4R_{rs}(667) - 0.0005 \frac{R_{rs}(667)}{R_{rs}(490)}$
If no $R_{rs}(667)$ measurements or measured $R_{rs}(667)$ out of the limits	$R_{rs}(667) = 1.27 (R_{rs}(\lambda_0))^{1.47} + $ $0.00018 \left(\frac{R_{rs}(490)}{R_{rs}(\lambda_0)} \right)^{3.19}$	278 (170)

Update of the Quasi-Analytical Algorithm (QAA_v6)

$u(\lambda) = \frac{-g_0 + \sqrt{(g_0)^2 + 4g_0 * g_1 * r_{r_n}(\lambda)}}{2g_1}, \text{ where } g_0 = 0.089 \text{ and } g_1 = 0.1245$ $IF R_n(665) < 0.0015 \text{ sr}^{-1} \qquad (else)$ $\chi = \log \frac{r_n(443) + r_n(490)}{r_n(560) + 5r_n(665)}, r_n(665) r_n(665)} = a_n(665) + 0.39 \frac{R^{\frac{1}{2}}(665)}{R^{\frac{1}{2}}(443) + R^{\frac{1}{2}}(490)} = a_n(665) + 0.39 \frac{R^{\frac{1}{2}}(665)}{R^{\frac{1}{2}}(443)} = a_n(665) + 0.39 \frac{R^{\frac{1}{2}}(665)}{R^{$		$u(\lambda) = \frac{r_{rs}(\lambda) = R_{rs}(\lambda)/(0.52 + 1.7 R_{rs}(\lambda))}{2g_1}, \text{ where } g_0 = 0.089 \text{ and } g_1 = 0.1245$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				
$ \chi = \log \frac{r_{rs}(443) + r_{rs}(490)}{r_{rs}(560) + 5 \frac{r_{rs}(665)}{r_{rs}(490)} r_{rs}(665)} = a_w(\delta_0) + a_v(\delta_0) + a_$		IF $R_{rs}(665) < 0.0015 \text{ sr}^{-1}$	(else)	
$b_{bp}(\lambda_0) = b_{bp}(560) = \frac{u(\lambda_0) \times a(\lambda_0)}{1 - u(\lambda_0)} - b_{bw}(560)$ $b_{bp}(\lambda_0) = b_{bp}(665) = \frac{u(\lambda_0) \times a(\lambda_0)}{1 - u(\lambda_0)} - \frac{b_{bw}(665)}{1 - u(\lambda_0)} - \frac{b_{bw}(665)}{r_{rs}(560)} -$	2	$a(\lambda_0) = a(560) = a_w(\lambda_0) + 10^{h0 + h1\chi + h2\chi^2}$		
$ \underbrace{b_{bp}(\lambda)}_{S} = \underbrace{b_{bp}(\lambda_{0})}_{L} \left(\frac{\lambda_{0}}{\lambda}\right)^{\frac{1}{\gamma}} dx + \underbrace{a(\lambda) = (1 - u(\lambda))(b_{bw}(\lambda) + b_{bp}(\lambda))/u(\lambda)}_{S \setminus S} $ $ \zeta = 0.74 + \underbrace{\frac{0.02}{0.8 + r_{rs}(443)/r_{rs}(560)}}_{S \setminus S} = \underbrace{\frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}}_{S \setminus S} = \underbrace{\frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}}_{S \setminus S} $ $ a_{g}(443) = \underbrace{\frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_{w}(416) - \zeta a_{w}(443)}{\xi - \zeta}}_{S \setminus S} , $	3	$b_{bp}(\lambda_0) = b_{bp}(560) = \frac{u(\lambda_0) \times a(\lambda_0)}{1 - u(\lambda_0)} - b_{bw}(560)$	$b_{bp}(\lambda_0) = b_{bp}(665) = \underbrace{u(\lambda_0)}_{1-u(\lambda_0)} \underbrace{a(\lambda_0)}_{0 \text{ bw}} (665)$	
$ \underbrace{b_{bp}(\lambda)}_{S} = \underbrace{b_{bp}(\lambda_{0})}_{L} \left(\frac{\lambda_{0}}{\lambda}\right)^{\frac{1}{\gamma}} dx + \underbrace{a(\lambda) = (1 - u(\lambda))(b_{bw}(\lambda) + b_{bp}(\lambda))/u(\lambda)}_{S \setminus S} $ $ \zeta = 0.74 + \underbrace{\frac{0.02}{0.8 + r_{rs}(443)/r_{rs}(560)}}_{S \setminus S} = \underbrace{\frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}}_{S \setminus S} = \underbrace{\frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}}_{S \setminus S} $ $ a_{g}(443) = \underbrace{\frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_{w}(416) - \zeta a_{w}(443)}{\xi - \zeta}}_{S \setminus S} , $		$ \eta = 2.0 \left(1 - 1.2 \exp \left(-0.9 \frac{r_{rs}(443)}{r_{rs}(560)} \right) \right) \text{lower wavelength} $		
$\zeta = 0.74 + \frac{0.02}{0.8 + r_{rs}(443)/r_{rs}(560)}$ $\xi = e^{S(4425-4155)}, S = 0.015 + \frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}$ $a_g(443) = \frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_w(416) - \zeta a_w(443)}{\xi - \zeta}$				
$\zeta = 0.74 + \frac{0.02}{0.8 + r_{rs}(443)/r_{rs}(560)}$ $\xi = e^{S(4425 - 415.5)}, S = 0.015 + \frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}$ $a_g(443) = \frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_w(416) - \zeta a_w(443)}{\xi - \zeta}$		$a(\lambda) = (1 - u(\lambda))(b_{bw}(\lambda) + b_{bp}(\lambda))/u(\lambda)$		
$\xi = e^{S(4425-4155)}, S = 0.015 + \frac{0.002}{0.6 + r_{rs}(443) / r_{rs}(560)}$ $a_g(443) = \frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_w(416) - \zeta a_w(443)}{\xi - \zeta} .$		$\zeta = 0.74 + \frac{0.02}{0.8 + r_{rs}(443)/r_{rs}(560)}$		
$a_{g}(443) = \frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_{w}(416) - \zeta a_{w}(443)}{\xi - \zeta} $	9	$\xi = e^{S(4425-415.5)}, S = 0.015 + \frac{0.002}{0.6 + r_{rs}(443)/r_{rs}(560)}$		
$a_{dg}(\lambda) = a_g(443)e^{-S(\lambda-443)}, \ a_{ph}(\lambda) = a(\lambda) - a_{dg}(\lambda) - a_w(443)$: 10	$a_{g}(443) = \frac{a(416) - \zeta a(443)}{\xi - \zeta} - \frac{a_{w}(416) - \zeta a_{w}(443)}{\xi - \zeta} .$		
		$a_{dg}(\lambda) = a_g(443)e^{-S(\lambda-443)}, a$	$a_{ph}(\lambda) = a(\lambda) - a_{dg}(\lambda) - a_{w}(443)$	