Consider the VR2009 model, equation (I)...

$$\frac{dH(t)}{dt} = a(T(t)-T_0) + b\frac{dT(t)}{dt} \qquad (I)$$

Let

$$T(t) = \sum_{i=0}^{n} T_i(t) \qquad (II)$$

Then

$$\frac{dH(t)}{dt} = a\left(\sum_{i=0}^{n} T_i(t)-T_0\right) + b\frac{d}{dt}\sum_{i=0}^{n} T_i(t)$$

$$= \left\{a(T_0(t)-T_0) + b\frac{dT_0(t)}{dt}\right\} + \left\{a\sum_{i=1}^{n} T_i(t) + b\frac{d}{dt}\sum_{i=1}^{n} T_i(t)\right\} \qquad (III)$$

Letting n = 1...

$$\frac{dH(t)}{dt} = \left\{a(T_0(t)-T_0) + b\frac{dT_0(t)}{dt}\right\} + \left\{aT_1(t) + b\frac{dT_1(t)}{dt}\right\} \qquad (IV)$$

Note that the first bracketed term on the right side of (VI) is exactly the same form as the right side of the VR2009 model, equation (I). Let's define the first bracket on the right side of (IV) as...

$$\frac{dH_{VR2009}(t)}{dt} = a(T_0(t)-T_0) + b\frac{dT_0(t)}{dt} \qquad (V)$$

So...

$$\frac{dH(t)}{dt} = \frac{dH_{VR2009}(t)}{dt} + \left\{aT_1(t) + b\frac{dT_1(t)}{dt}\right\} \qquad (VI)$$

VR2009 used 120 years of historical temperature and sea level data in equation (I) to find the best fit values for a, T_0, and b. Once these three values were found, 342 different temperature projectons for the 21st century were applied to (I) to yield 342 different sea level rise rate projections for the 21st century. In this context, $d/dt(H_{vr2009}(t))$ is simply the sea level rise rate found by VR2009 for any chosen temperature projection.

Now, let $T_1(t)$ be given by...

$$T_1(t) = C\exp\left(\frac{-a}{b}\gamma(t-t')\right) \qquad (VII)$$

Substituting (VII) into (VI) gives...

$$\frac{dH(t)}{dt} = \frac{dH_{VR2009}(t)}{dt} + C\,a(1-\gamma)\exp\left(\frac{-a}{b}\gamma(t-t')\right) \qquad (VII)$$