Global Mean Sea Level until 2100

Sjaak Uitterdijk
sjaakenlutske@hetnet.nl

Abstract- Global Mean Sea Level is a hot topic now a days, because maybe we will eventually drown in the oceans. The most intricate models for it's increase in the future have been created and will be created, some of them leading to the most worst thinkable scenario in 2100.

Introduction

Several organisations realize data sets for the GMSL. I asked them all for numerical data. The only one that did react fast as well as with appropriate data for my purpose was CSIRO.
This data has been presented in: http://www.cmar.csiro.au/sealevel/GMSL_SG_2011_up.html
It shows, in the period 1880-2013, for each month the GMSL. This high resolution was necessary in order to find out whether there might be a (seasonal) sinusoidal anomaly, as suggested in figure 1, shown in https://www.aviso.altimetry.fr/en/data/products/ocean-indicators-products/mean-sea-level/products-images.html

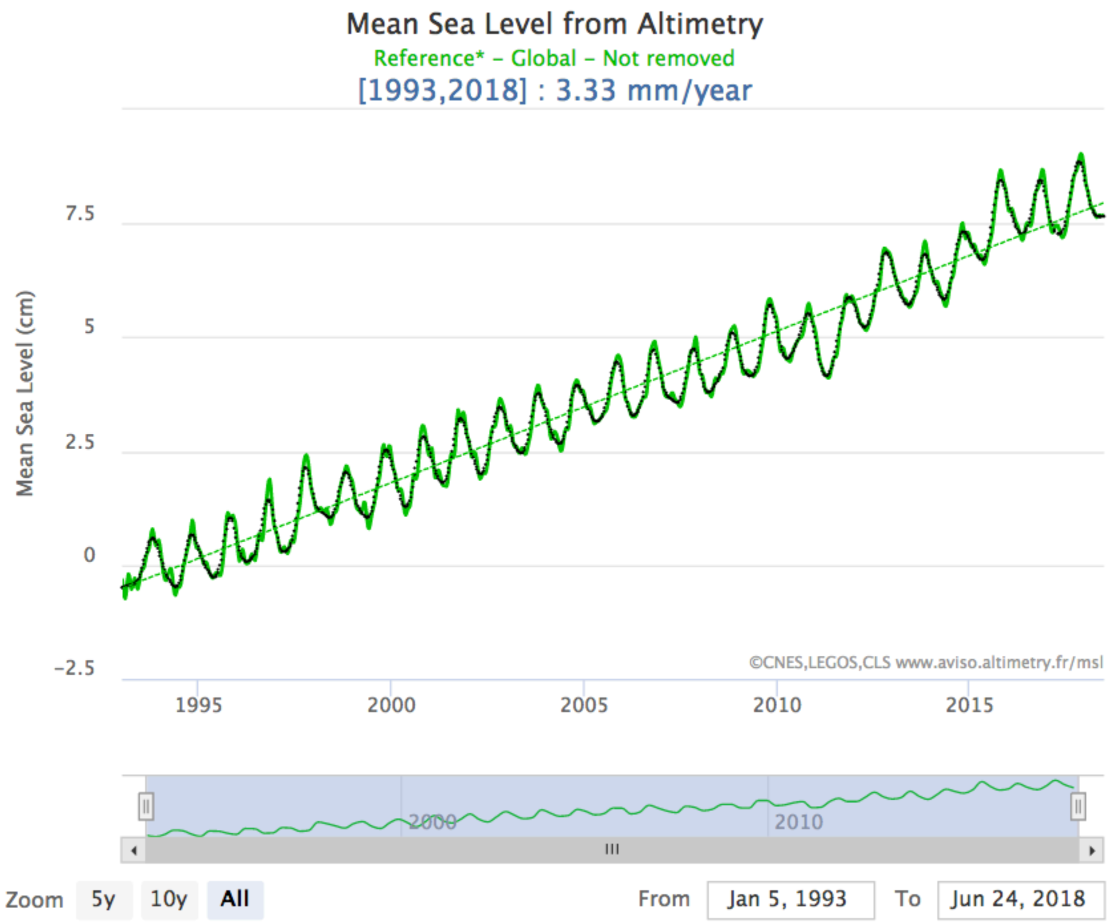

Figure 1

The data of CSIRO does not show such sinusoidal anomaly at all. So what might be the truth?
If the data set of AVISO would be correct, then there might be an interesting (cor)relation between the global CO_2 concentration in the atmosphere, the global temperature and the GMSL. See [1].

Presentation of CSIRO data set

Figure 2 clearly shows such a less periodic result than shown in figure 1, that it is not considered worthwhile to analyse it deeper, in relation to what is presented in [1].

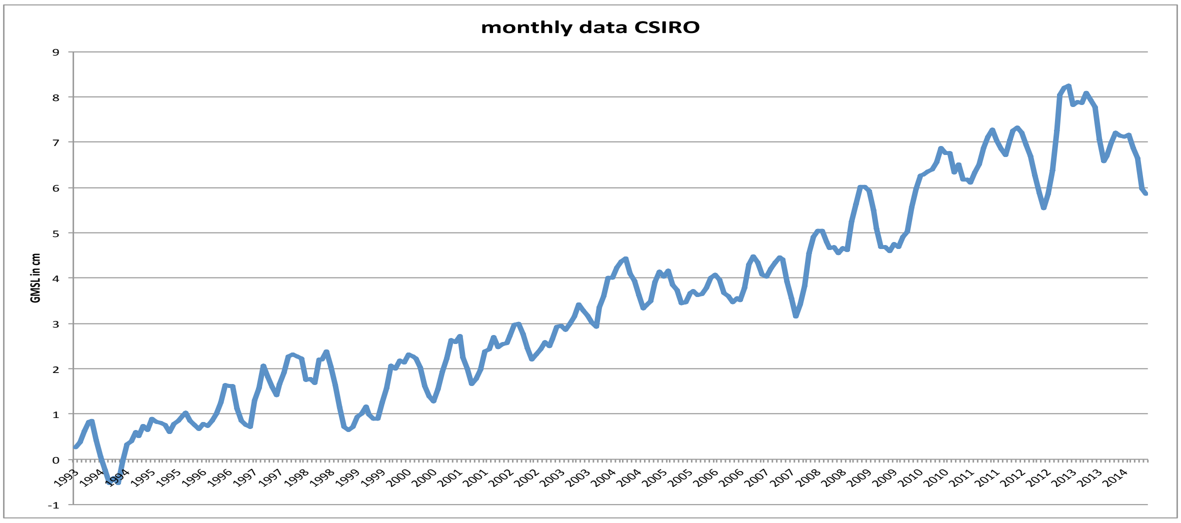

Figure 2

The next step that is made is the realisation of a graph of all the data presented as function of time t and to draw a smooth curve through it. The type of applied curve is $y = c + a*t^b$.

In order to be able to calculate the 3 parameters a, b and c, 3 points out of the collection of measured data, as function of time, have to be taken.
A condition is that a rather clear tendency can be observed in the selected data.
The appendix shows the mathematical background for the solution of these parameters.

In the first situation, from now on called 'normal' situation, the mean value of the data at the beginning, the end and in the middle is chosen. The result is shown in figure 3.

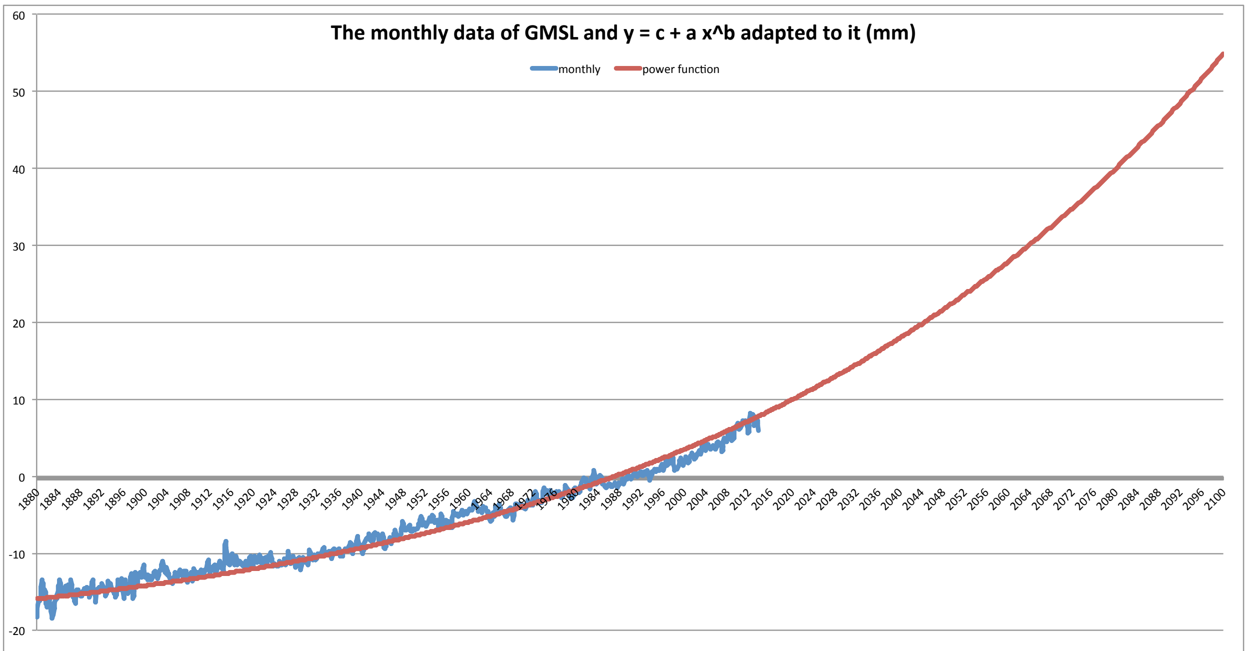

Figure 3: GMSL in the normal situation in 2100: 54 cm

In the best-case situation the minimum value between 1880 and 1884 is taken and the maximum value around 2013. The middle value is kept the same. See figure 4.

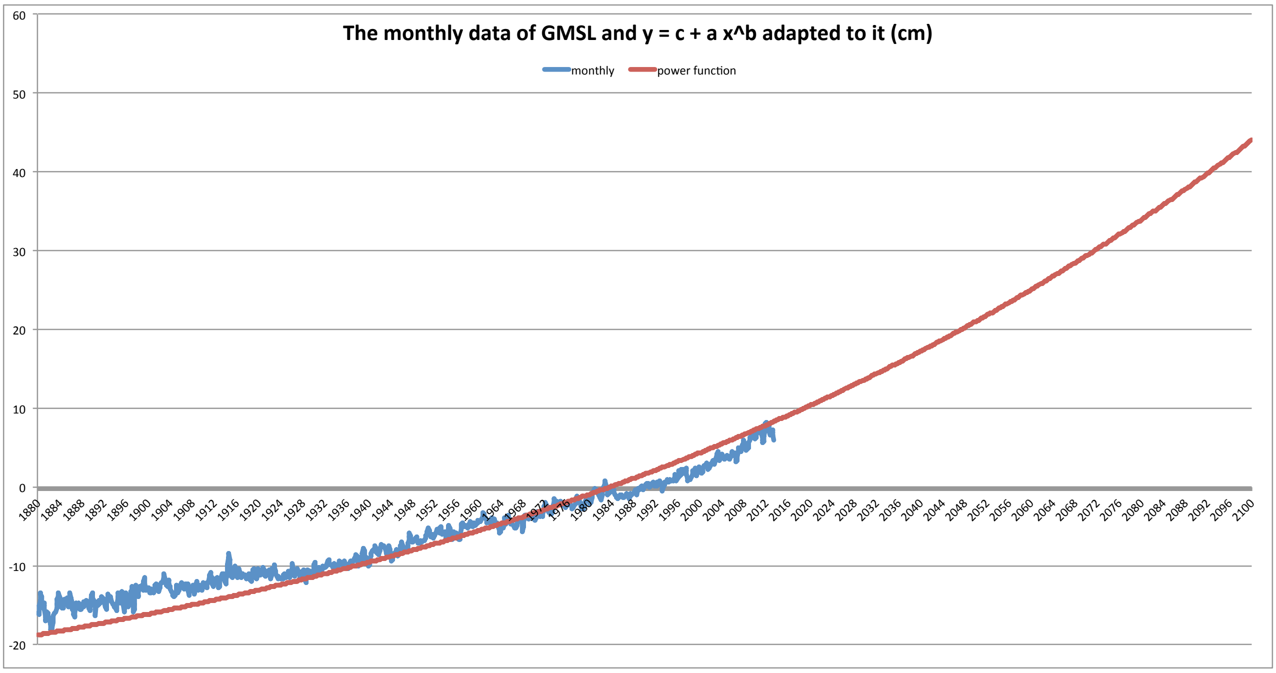

Figure 4: GMSL in the best-case situation in 2100: 44 cm

In the worst-case situation the maximum value between 1880 and 1884 is taken and the minimum value around 2013. The middle value is again kept the same. See figure 5.

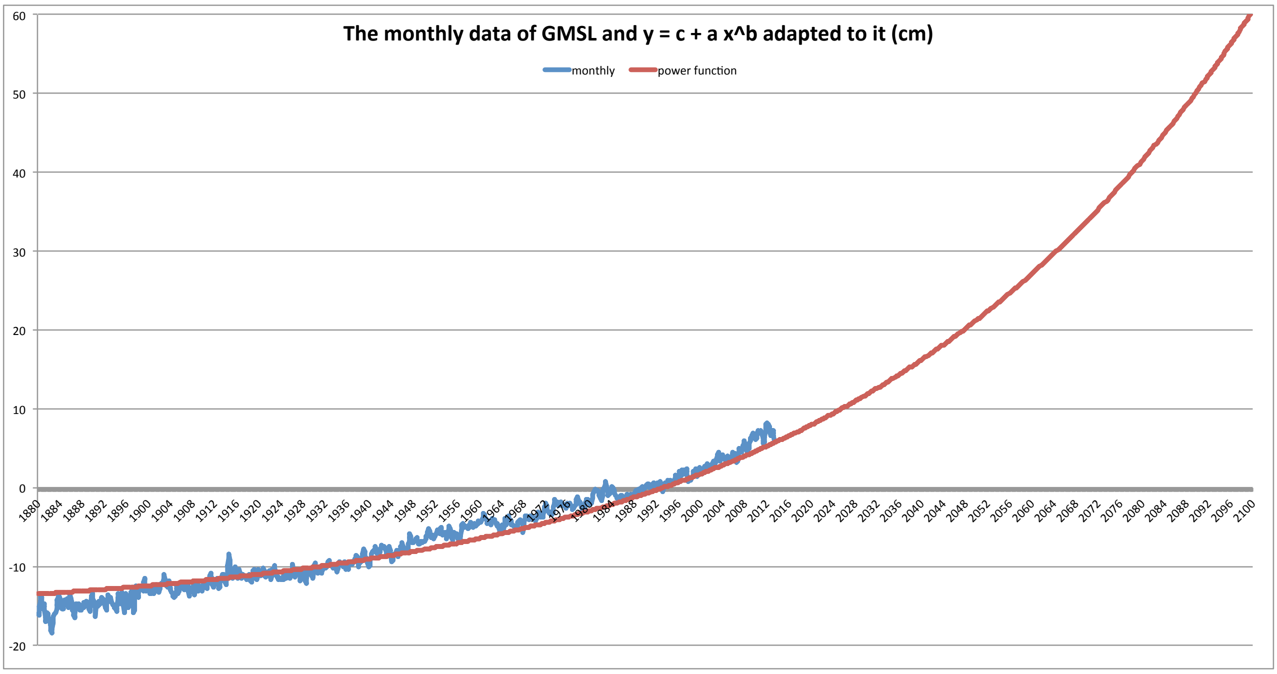

Figure 5: GMSL in the worst case situation in 2100: 60 cm

The mean value in 2100 of the best- and worst-case situation is 52 cm, quite the same as found in the normal situation: 54 cm.
Based on these calculations it is concluded that in 2100 the GMSL will be 54 cm with a confidence level 95%.
But this is based on the assumption that the world population will grow as shown in [2].

The curves of the GMSL show resemblance with the curves of the CO_2 concentration in the atmosphere, the global temperature and the world population. For more background see [2]. A closer investigation of this resemblance learns that it shows an almost perfect resemblance if the worst-case curve of the GMSL is shifted 100 years back in time. See figure 6.
The mathematical expression for this curve is GMSL = $-16.412 + 3.008*10^{-97} * year^{29.621}$ cm.

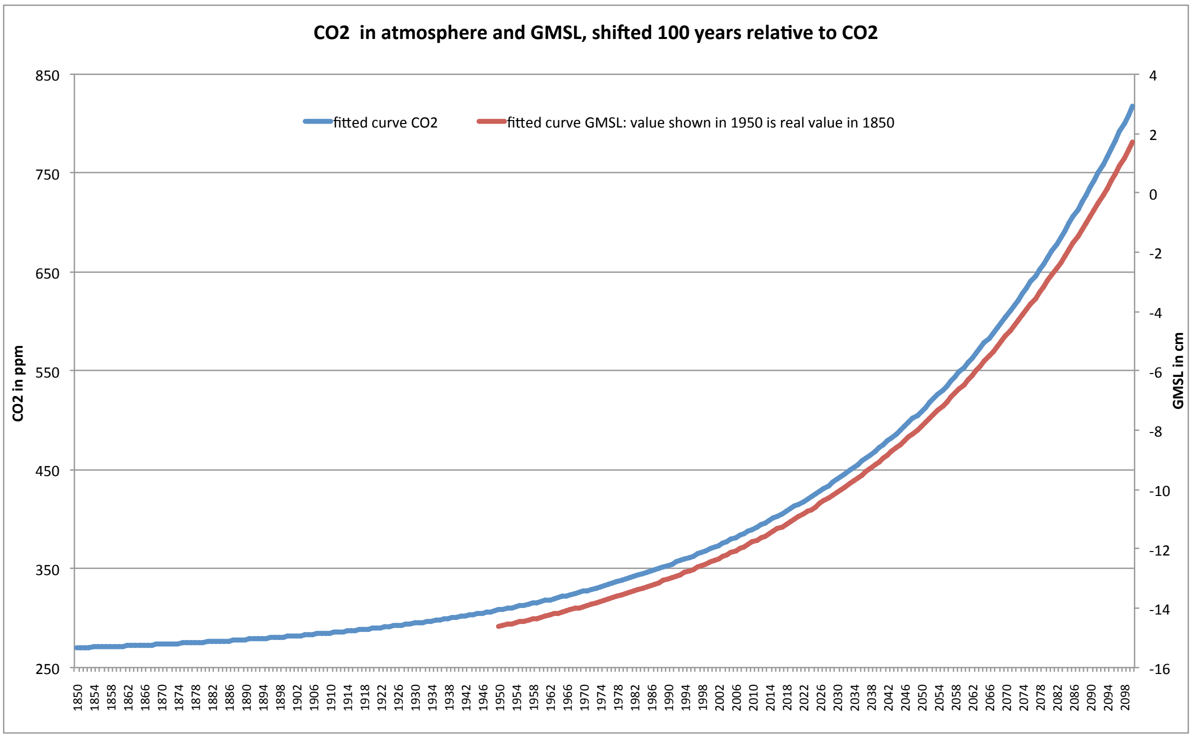

Figure 6: GMSL value shown in 1950 is real value in 1850

The same phenomenon is shown in figure 7 in which the curve of the CO_2 concentration is shifted 100 years into the future.

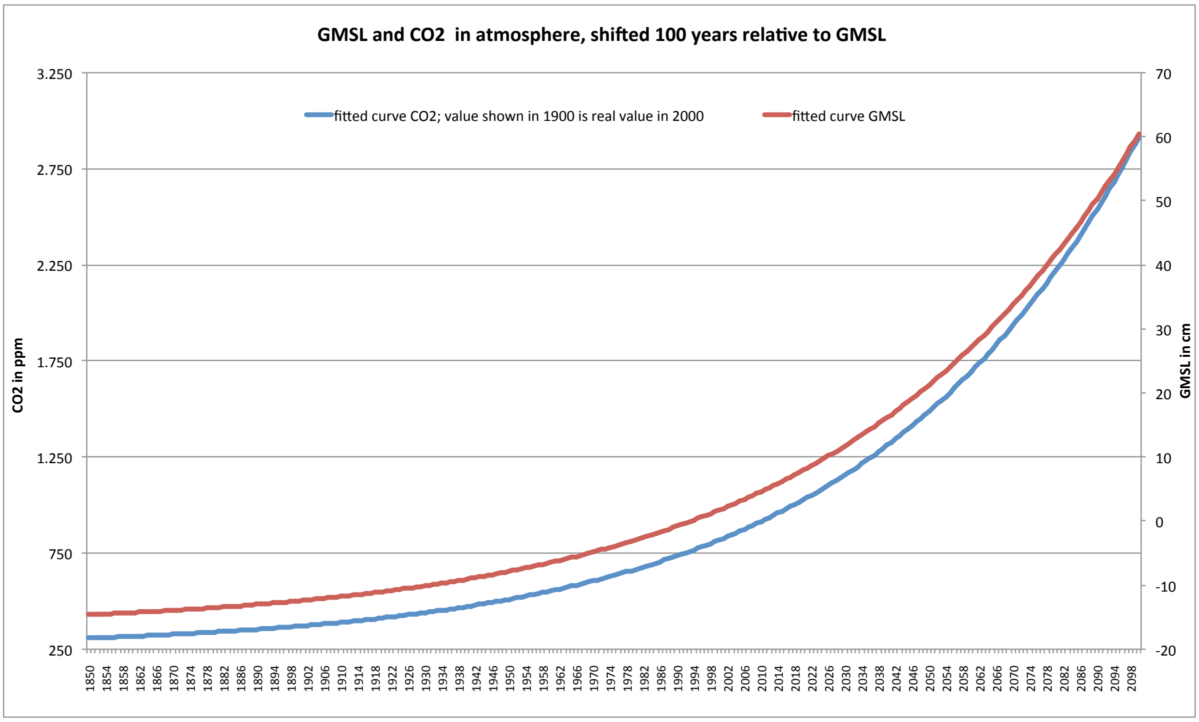

Figure 7: CO_2 value shown in 1900 is real value in 2000

Conclusions

1. The conclusion that might be drawn from the presented resemblances between the GMSL curve and the curves of the CO2 concentration in the atmosphere, the global temperature and the world population, is that the GMSL reacts with a delay of 100 years relative to all of them.
2. These resemblances also might mean that even if the global temperature would *stop increasing* right now, the GMSL will only *stop increasing* after 100 years.
3. Reference [3] shows, in Table 1, a GMSL in the range 265 - 339 cm in the year 2100. The curve fitting, applied to the GMSL in this article from 1880 until 2013, predicts in the worst-case situation a GMSL of 289 cm, following from:

$$GMSL = -16.4 + 3.01 * 10^{-97} * year^{29.621} \text{ cm.}$$

References

[1] Monthly Anomalies of Global CO_2-Concentration and Temperature
http://vixra.org/abs/1711.0132

[2] The Relation Between CO_2, Global Temperature and World Population
http://vixra.org/abs/1601.0313

[3] A high-end sea level rise probabilistic projection including rapid Antarctic ice sheet mass loss
Dewi Le Bars, Sybren Drijfhout and Hylke de Vries
http://iopscience.iop.org/article/10.1088/1748-9326/aa6512/meta

Appendix

Mathematical background of the curve fitting $y=c + a.x^b$

This curve fitting may be applied only to a series of measurements that show already a smooth shape, so with small random deviations.

Given the measuring points: (x_1, y_1), (x_2, y_2) en (x_3, y_3) the solution of the constant c is as follows:

$y_1\text{-}c= a.x_1^b$ $\quad y_2\text{-}c= a.x_2^b$ $\quad y_3\text{-}c= a.x_3^b$

$(y_1\text{-}c)/(y_2\text{-}c) = x_{12}^b$ $\quad$ with $x_{12}=x_1/x_2$

Take the logarithm on both sides:

$\log\{(y_1\text{-}c)/(y_2\text{-}c)\} = b.\log(x_{12})$

In the same way:

$\log\{(y_2\text{-}c)/(y_3\text{-}c)\} = b.\log(x_{23})$ $\quad$ with $x_{23}=x_2/x_3$

The quotient of both equations results in:

$$\log\{(y_1\text{-}c)/(y_2\text{-}c)\} / \log\{(y_2\text{-}c)/(y_3\text{-}c)\} = \log(x_{12}) / \log(x_{23})$$

c can only be solved numerically by means of an iteration process, applied to the function :

$$\log\{(y_1\text{-}c)/(y_2\text{-}c)\} / \log\{(y_2\text{-}c)/(y_3\text{-}c)\} - x_{123} = 0 \qquad \text{with: } x_{123} = \log(x_{12})/\log(x_{23})$$

Having calculated c, b follows from:

$b=\log\{(y_1\text{-}c)/(y_2\text{-}c)\}/\log(x_{12})$

And a from:

$a=(y_2\text{-}c)/x_2^b$