

# 2nd Review on “From model to radar variables: a new forward polarimetric radar operator for COSMO” from Wolfensberger et. al

Anonymous reviewer

## 1 General Comments

The authors have done a good job in improving the manuscript and I am generally satisfied as to how my comments have been addressed. Only two minor issues are listed below, which I regard as technical corrections and which are easy to correct.

## 2 Technical Correction

### Page 33, line 1:

The numeric representation of the convolution of  $S$  with the Gaussian distribution function of turbulence (let's call it  $p$ ) in Eq. (52) is still not correct. It should be a numerical representation of the convolution integral

$$S(v) = \int_{-\infty}^{\infty} S(v') p(v - v') dv' \quad (1)$$

with

$$\int_{-\infty}^{\infty} p(v - v') dv' = 1 \quad (2)$$

Eq. (1) can therefore be written as

$$S(v) = \frac{\int_{-\infty}^{\infty} S(v') p(v - v') dv'}{\int_{-\infty}^{\infty} p(v - v') dv'} \quad (3)$$

Two points:

- 1) the sum of weights (the discrete  $p(v_i - v_j)$  values) in Eq. (52) is not 1 but their integral, provided the range of  $v_j$ -values adequately covers the Gaussian tails.
- 2) the sum in Eq. (52) does not cover the whole integration range  $[-\infty, \infty]$ , so the numerical fulfillment of 1) depends on the mean and standard deviation of  $p$  in relation to the range of  $v_j$ -values.

Taking these points into account, I would propose the following bias-free numerical formula:

$$S_i = \frac{\sum_{j=0}^{N_{fft}} S_j p(v_i - v_j) \Delta v}{\sum_{j=0}^{N_{fft}} p(v_i - v_j) \Delta v} = \frac{\sum_{j=0}^{N_{fft}} S_j p(v_i - v_j)}{\sum_{j=0}^{N_{fft}} p(v_i - v_j)} \quad (4)$$

assuming equidistant spacing  $\Delta v$  of the  $v_j$  values. This is what I meant by “You have to divide by the sum of the Gaussian weights”.

Because the authors used a library function to compute the convolution (which I would assume to be working correctly), only the formula in the text has to be changed, not the results.

**Page 4, line 16-20:**

Your COSMO version 5.04 does contain ice sedimentation in the microphysics. The COSMO version numbers are unfortunately not consistently used in the COSMO community. Actually your version 5.04 is the same as 5.4, just an incoherent version number labelling across developers. Therefore, your 5.04 is newer than what I called 5.1 in my previous review and includes ice sedimentation. Sorry, I should have called it 5.01 to maintain consistency.