

# Supplement – Quantitative photoacoustic oximetry imaging by multiple illumination learned spectral decoloring

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This supplement presents all rCu estimation results for all data sets and for all models – random forests (RF) and neural networks (NN) with and without dropout. It also reports complete rCu estimation errors( $\Delta rCu^{est}$ ) and absolute rCu estimation errors( $|\Delta rCu^{est}|$ ) over all separate data sets in error distribution figures. The examples shown in the main manuscript are figure 12 right, 57 right, 54 right and 4.

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		set	$\Delta rCu^{est}$ [p.p.]				$ \Delta rCu^{est} $ [p.p.]				
			mean	$Q_1$	$Q_2$	$Q_3$	mean	$Q_1$	$Q_2$	$Q_3$	$P_{90}$
RF	MI-LSD	B	0.6	-2.7	1.1	3.4	4.1	1.4	2.9	5.3	8.8
		C	1.8	-3.1	1.7	6.3	5.6	2.1	4.5	7.9	12.4
	LSD	B	-1.9	-4.4	0.2	2.2	5.2	1.5	3.3	6.2	10.7
		C	-2.8	-5.3	0.6	2.6	7.1	1.7	3.9	7.9	13.7
NN	MI-LSD	B	-11.3	-18.4	-3.6	0.3	12.8	1.3	5.3	18.4	36.2
		C	-21.0	-38.2	-12.0	0.1	22.0	2.2	12.0	38.2	58.1
	LSD	B	-3.1	-5.9	-0.3	1.8	6.4	1.1	3.4	8.1	16.7
		C	-8.7	-15.1	-2.6	1.3	11.4	1.7	5.8	15.7	32.6
LU	B	-1.2	-8.8	0.1	6.6	8.2	4.0	7.4	11.1	15.2	
	C	-1.0	-8.0	-0.5	6.3	8.7	3.4	7.2	12.5	18.2	

Table 1: Relative rCu estimation errors( $\Delta rCu^{est}$ ) and absolute rCu estimation errors( $|\Delta rCu^{est}|$ ) for the random forests (RF), neural networks (NN) and linear unmixing. Mean, median  $Q_2$ , 1st and 3rd quartiles  $Q_1$  and  $Q_3$ , and the 90 percentile  $P_{90}$  are listed for the phantom test sets B (transversal tubes) and C (longitudinal tubes).

## 1 in silico Sets

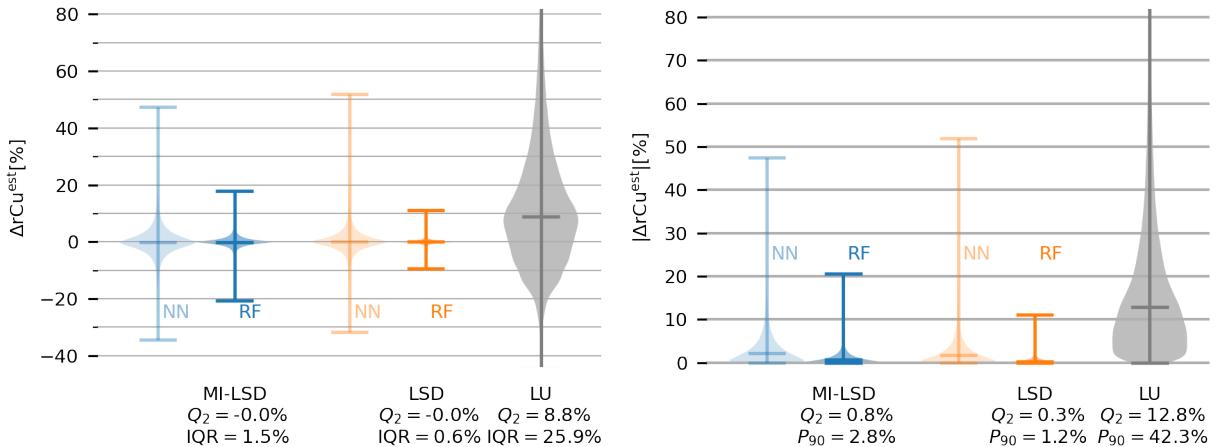


Figure 1: Estimation error distribution on the *in silico training set*. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and gray is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

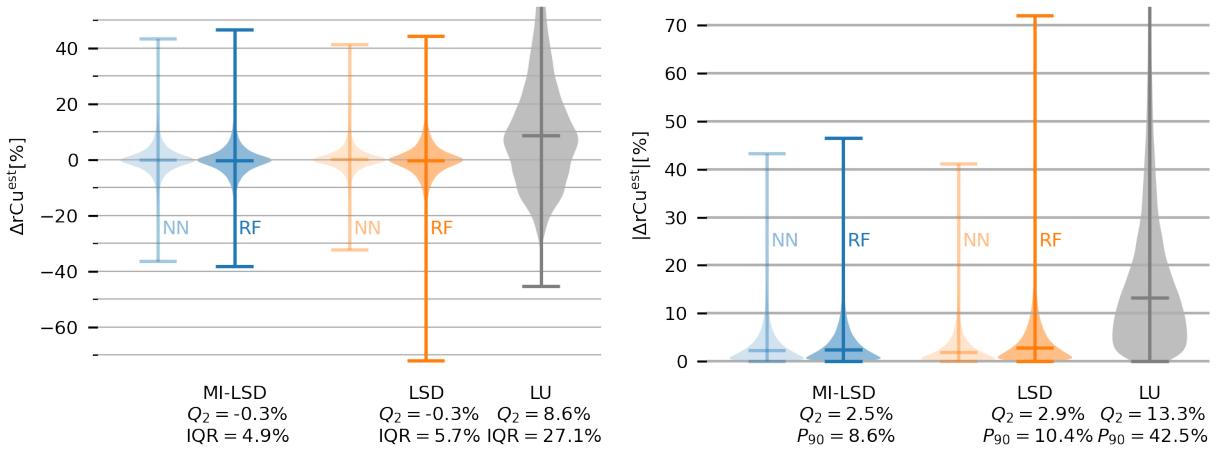


Figure 2: Estimation error distribution on the *in silico* test set. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and gray is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

## 2 Phantom Test Set B

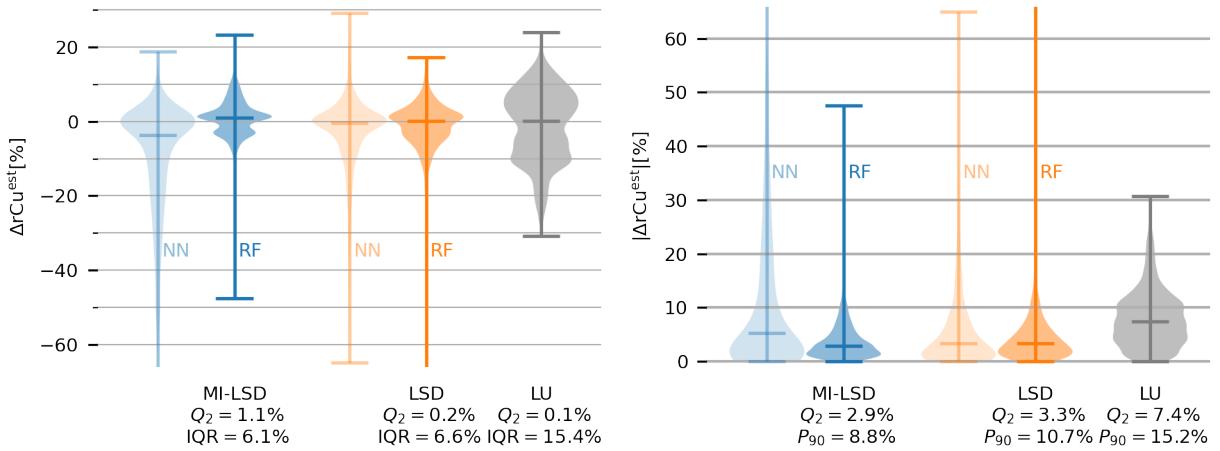


Figure 3: Estimation error distribution on the transversal phantom *test* set. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and gray is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

## 2.1 Random Forest (RF)

### 2.1.0.1 Baseline – 0% sulfate volume fraction (svf)

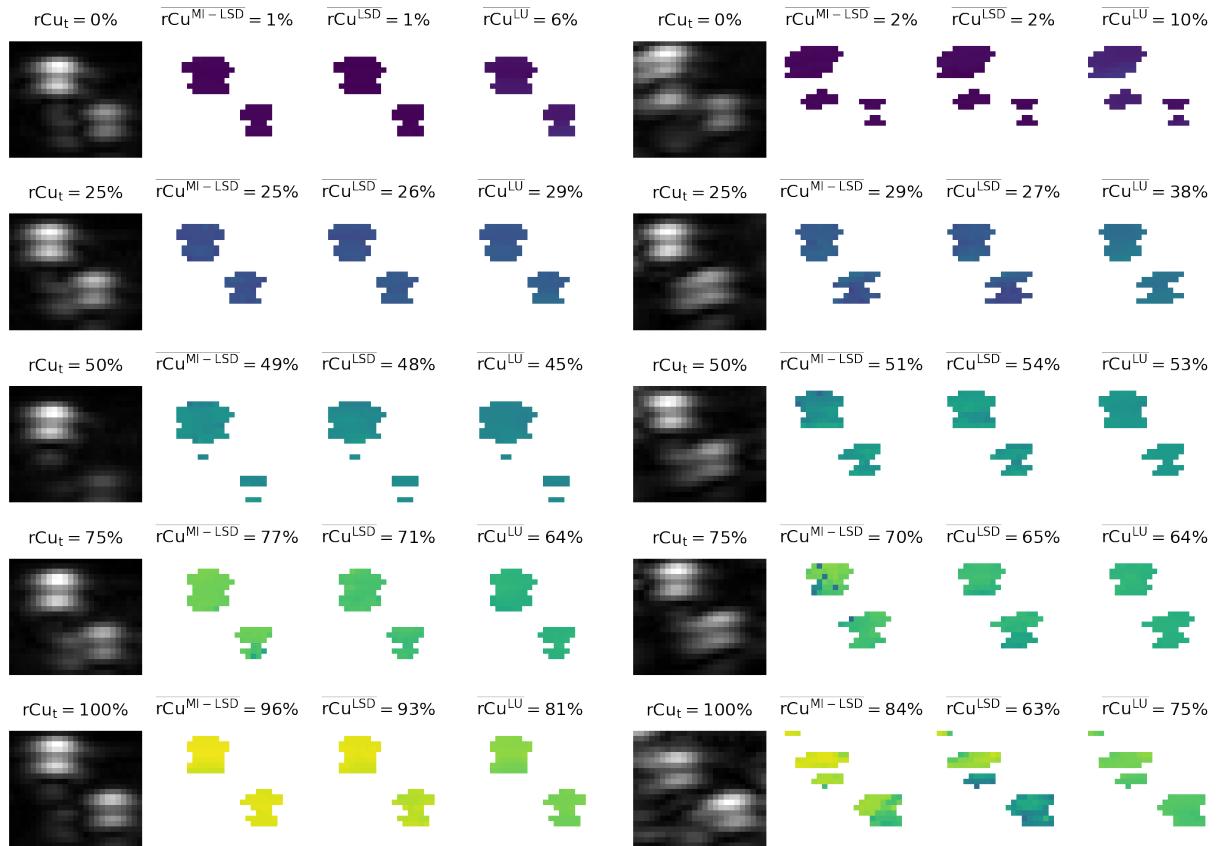


Figure 4: Baseline 0, RF – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

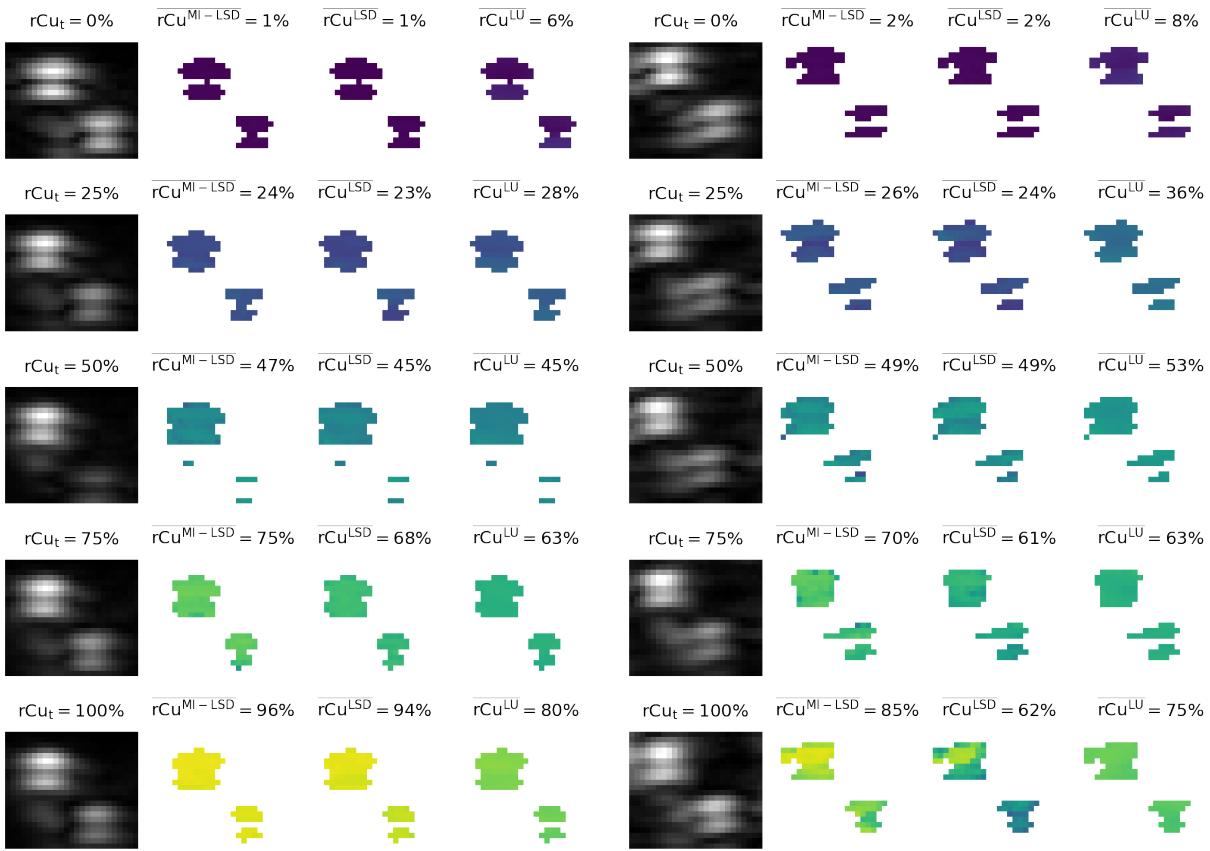


Figure 5: Baseline 1, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

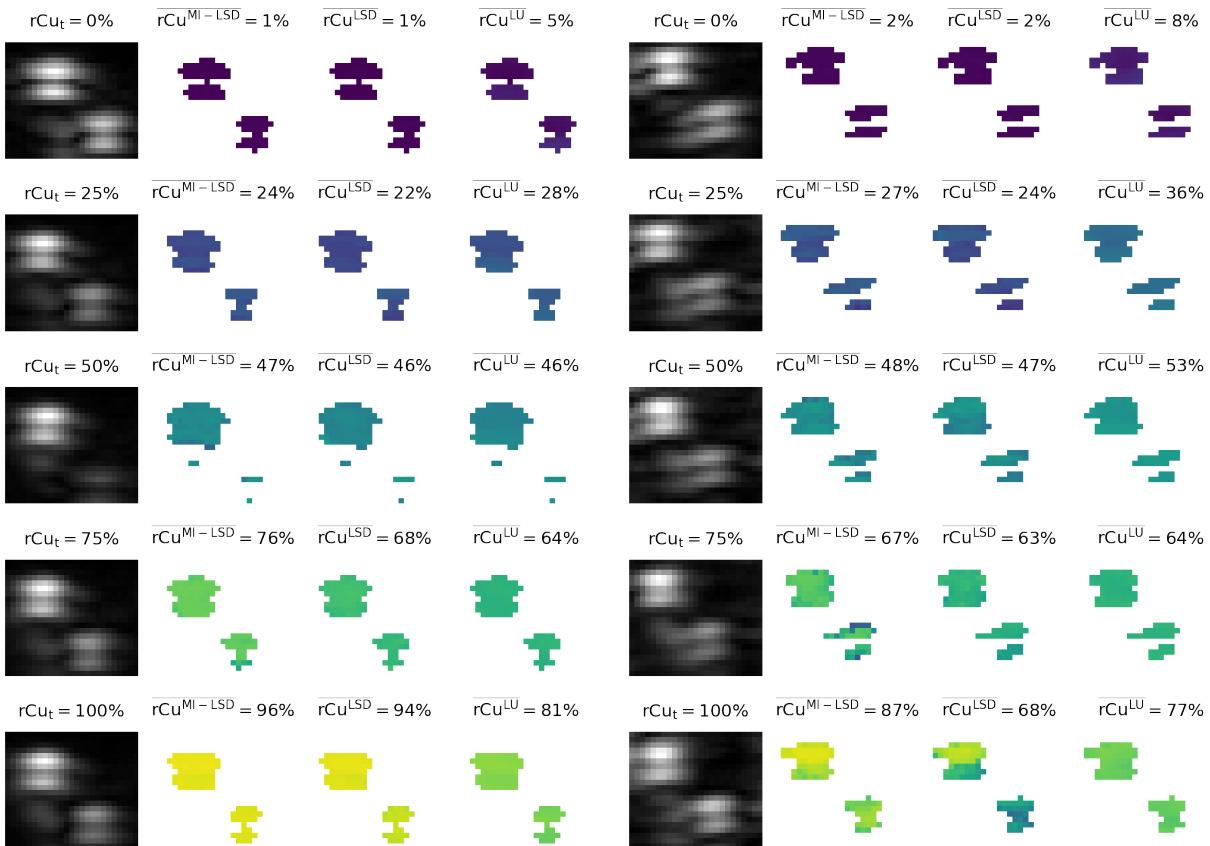


Figure 6: Baseline 2, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

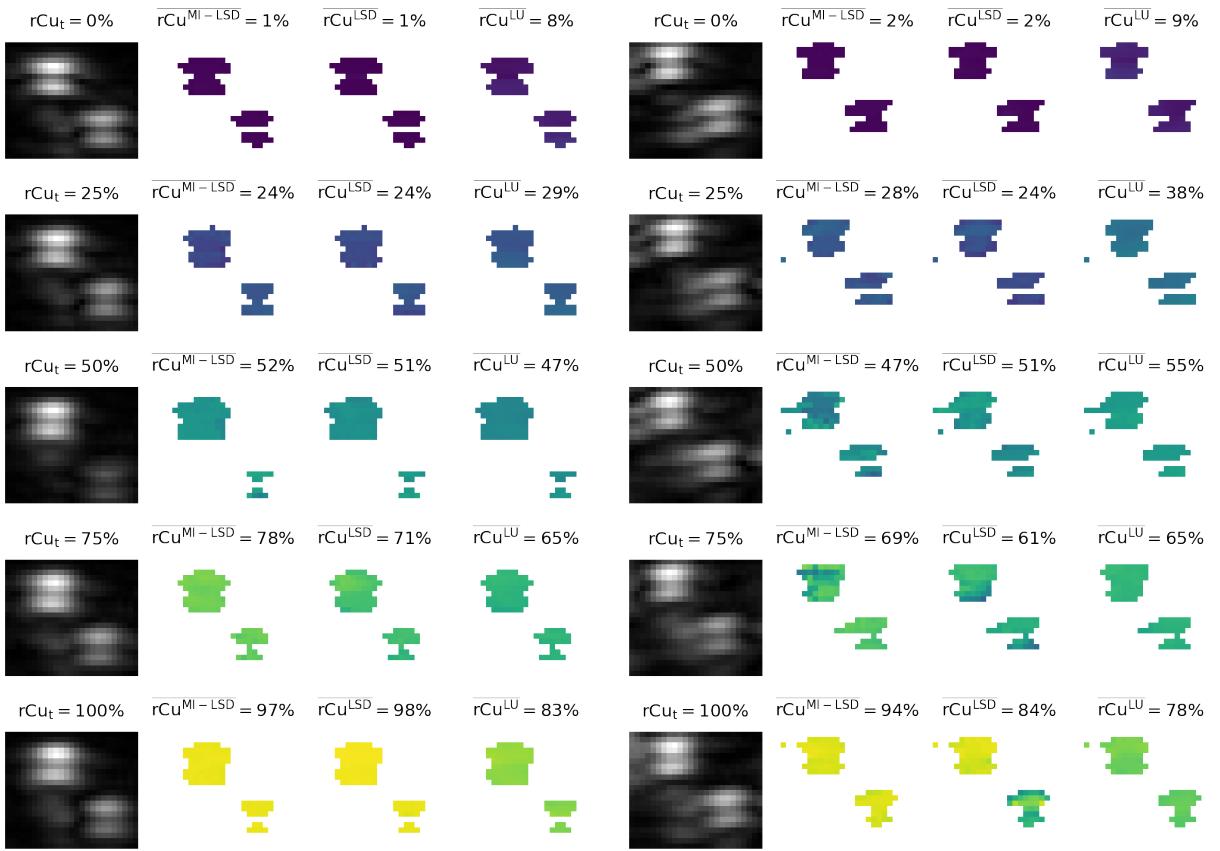


Figure 7: Baseline 3, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

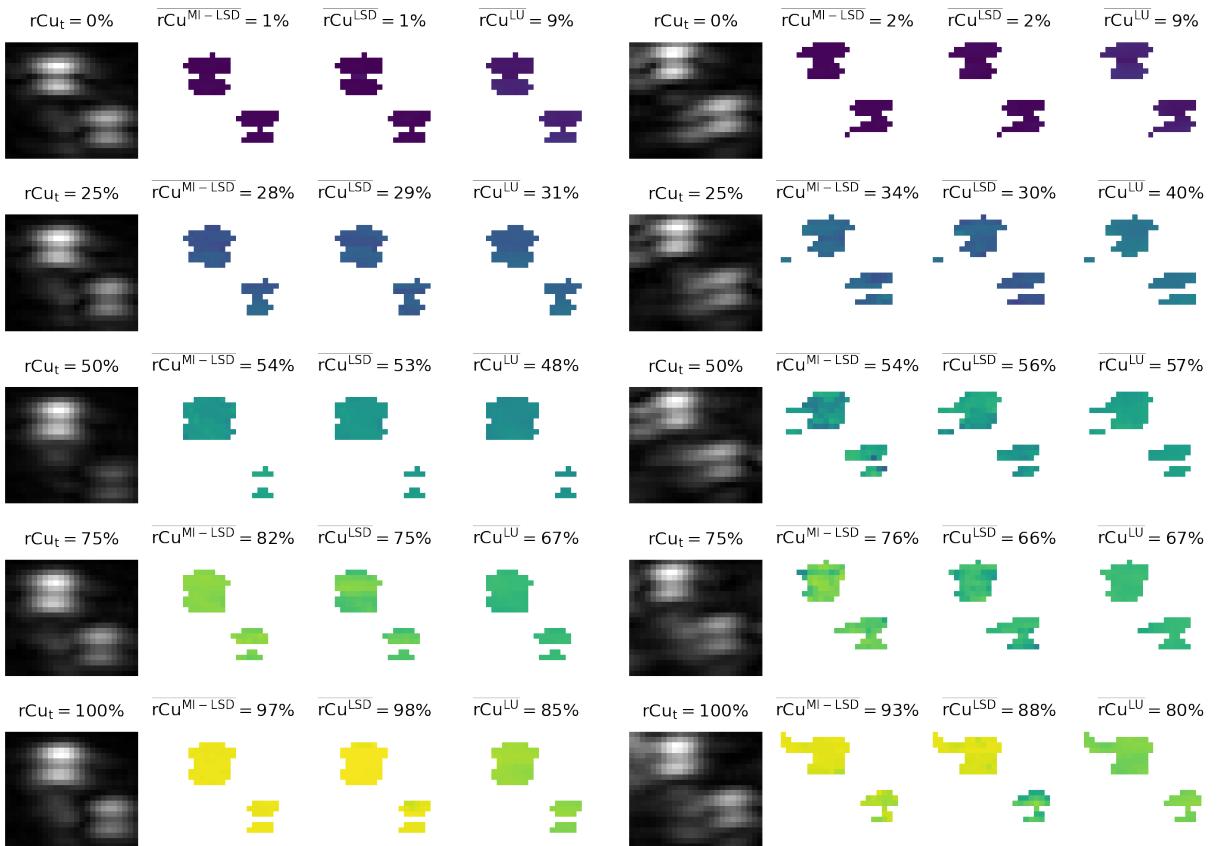


Figure 8: Baseline 4, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

### 2.1.0.2 0.5% sulfate volume fraction (svf)

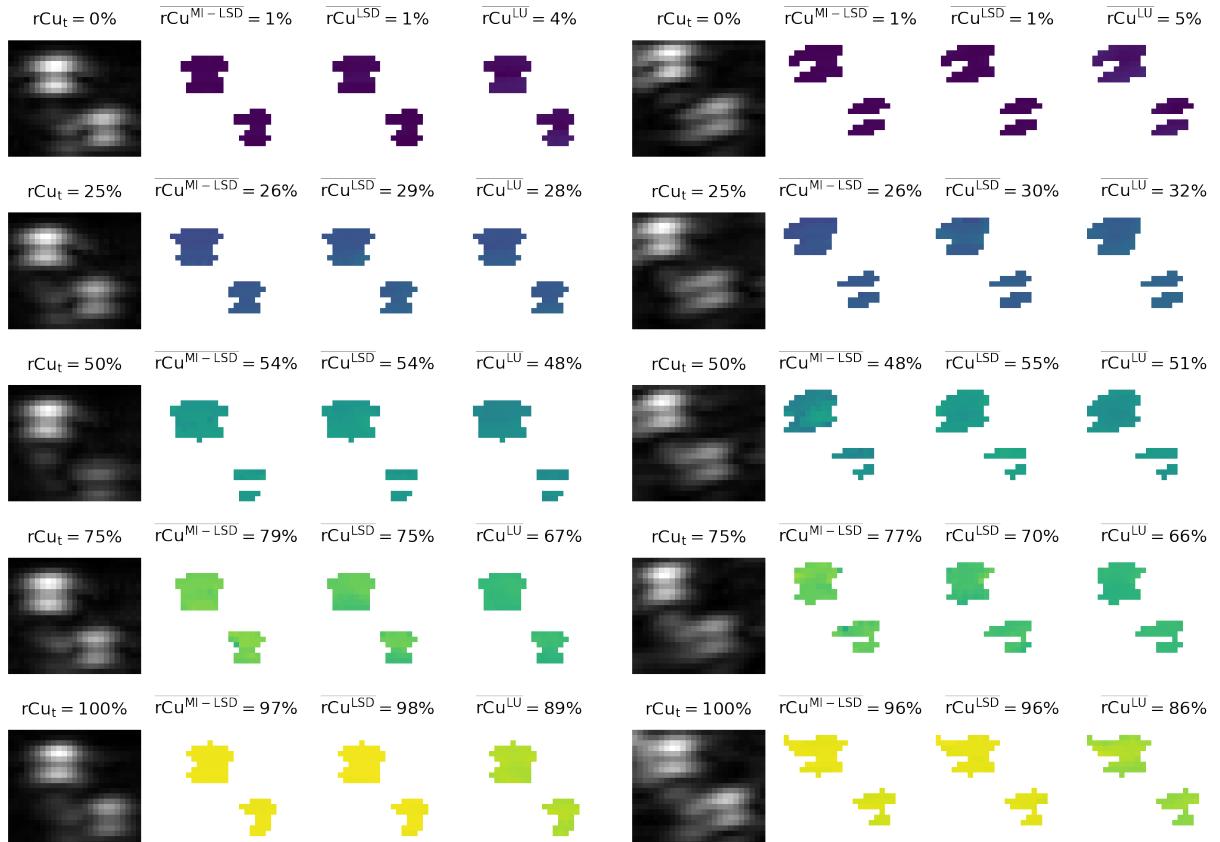


Figure 9:  $rCu_{bg} = 100\%$ , svf = 0.5%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

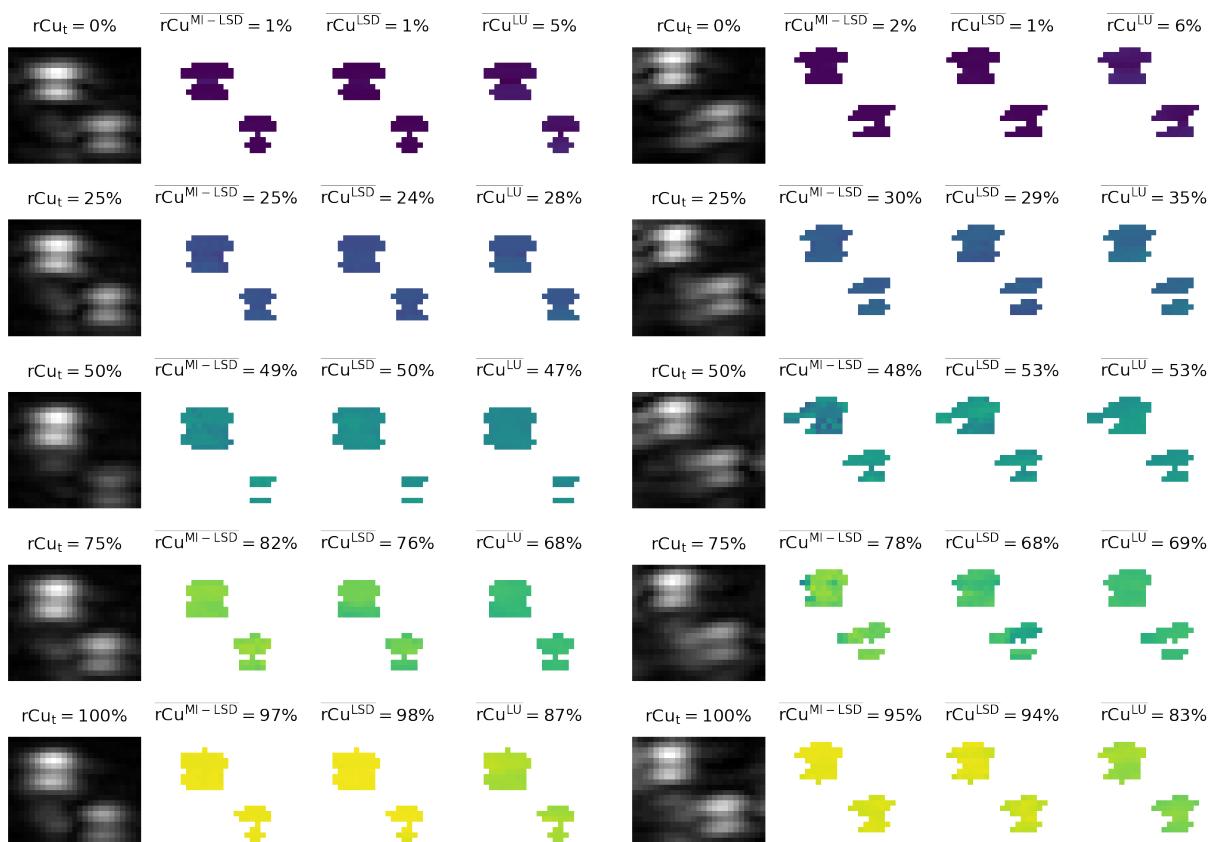


Figure 10:  $rCu_{bg} = 75\%$ , svf = 0.5%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

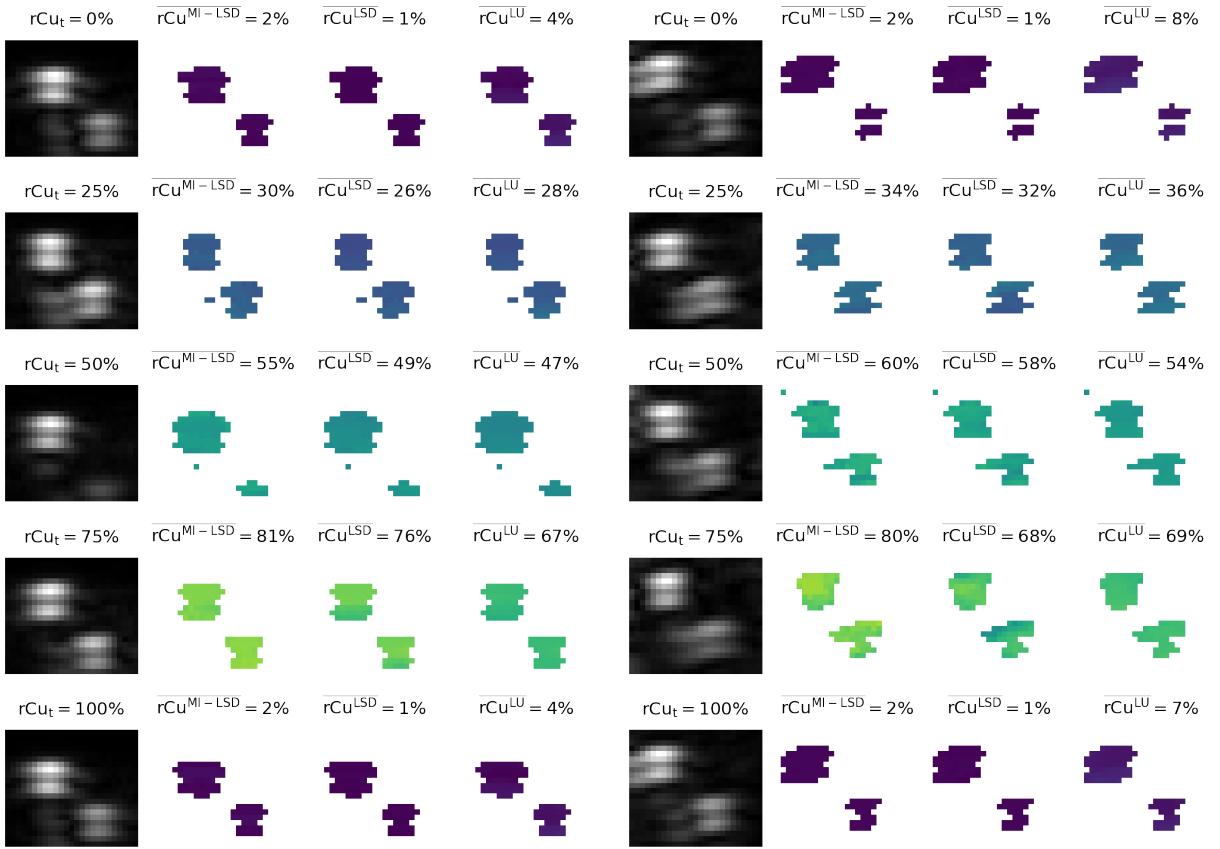


Figure 11:  $rCu_{bg} = 50\%$ ,  $svf = 0.5\%$ , RF – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates Note: Due to a phantom positioning oversight, the  $rCu_t = 100\%$  measurement had an actual  $rCu$  of 0% and was omitted from further analysis.

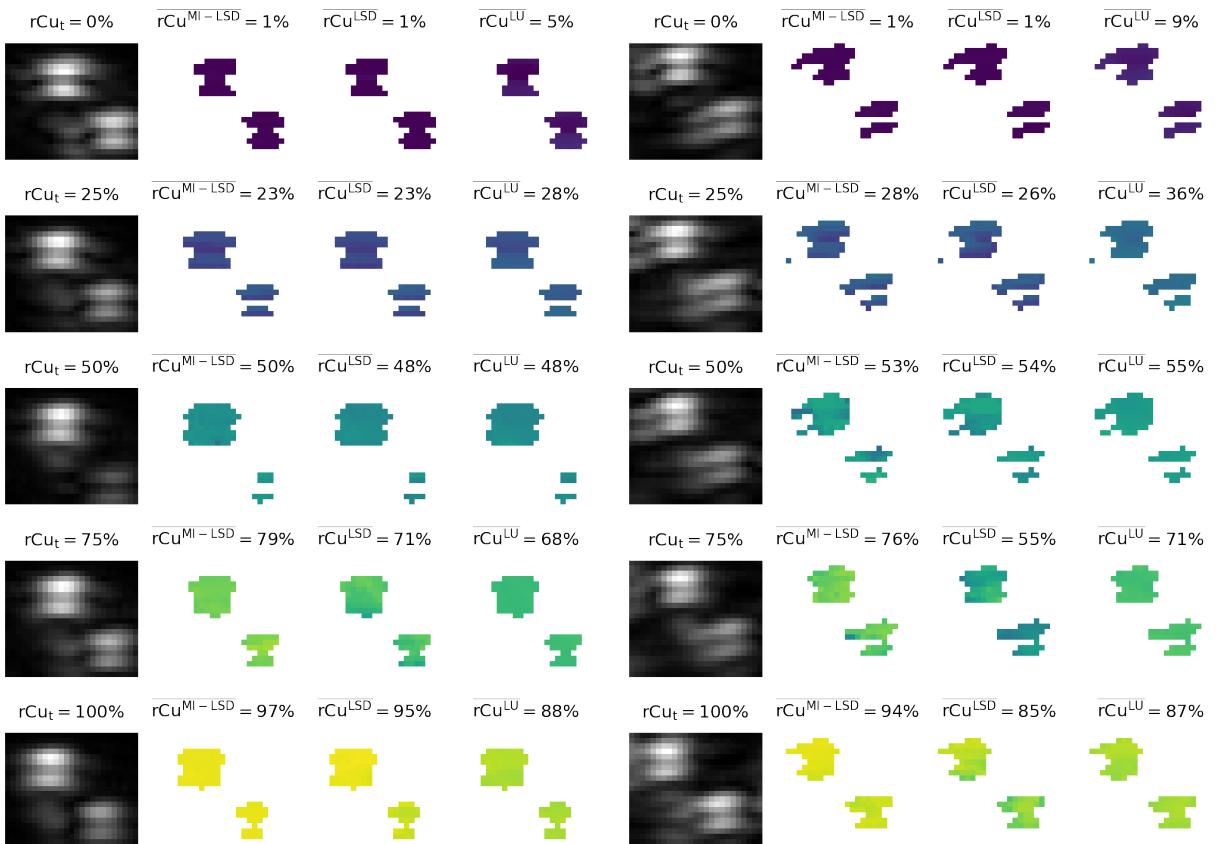


Figure 12:  $rCu_{bg} = 25\%$ ,  $svf = 0.5\%$ , RF – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

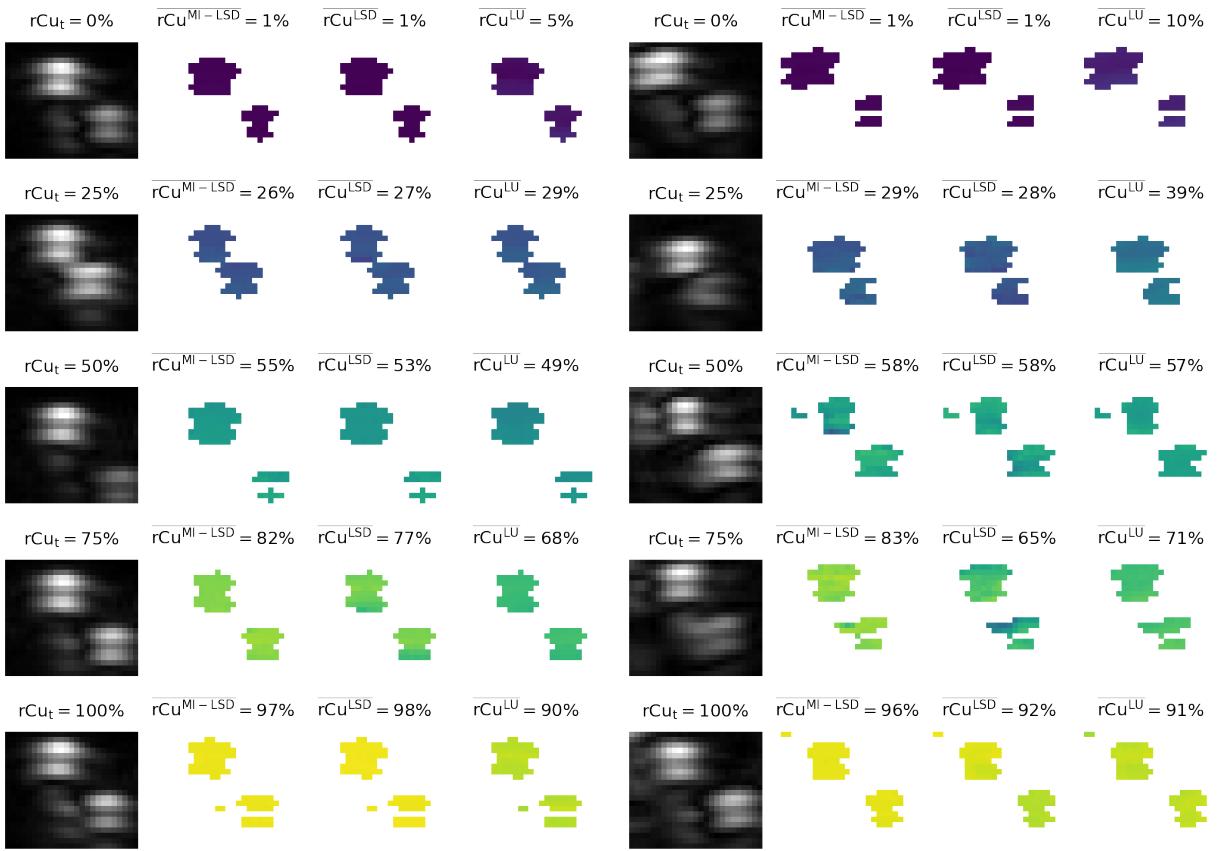


Figure 13:  $rCu_{bg} = 0\%$ , svf = 0.5%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

#### 2.1.0.3 1.0% sulfate volume fraction (svf)

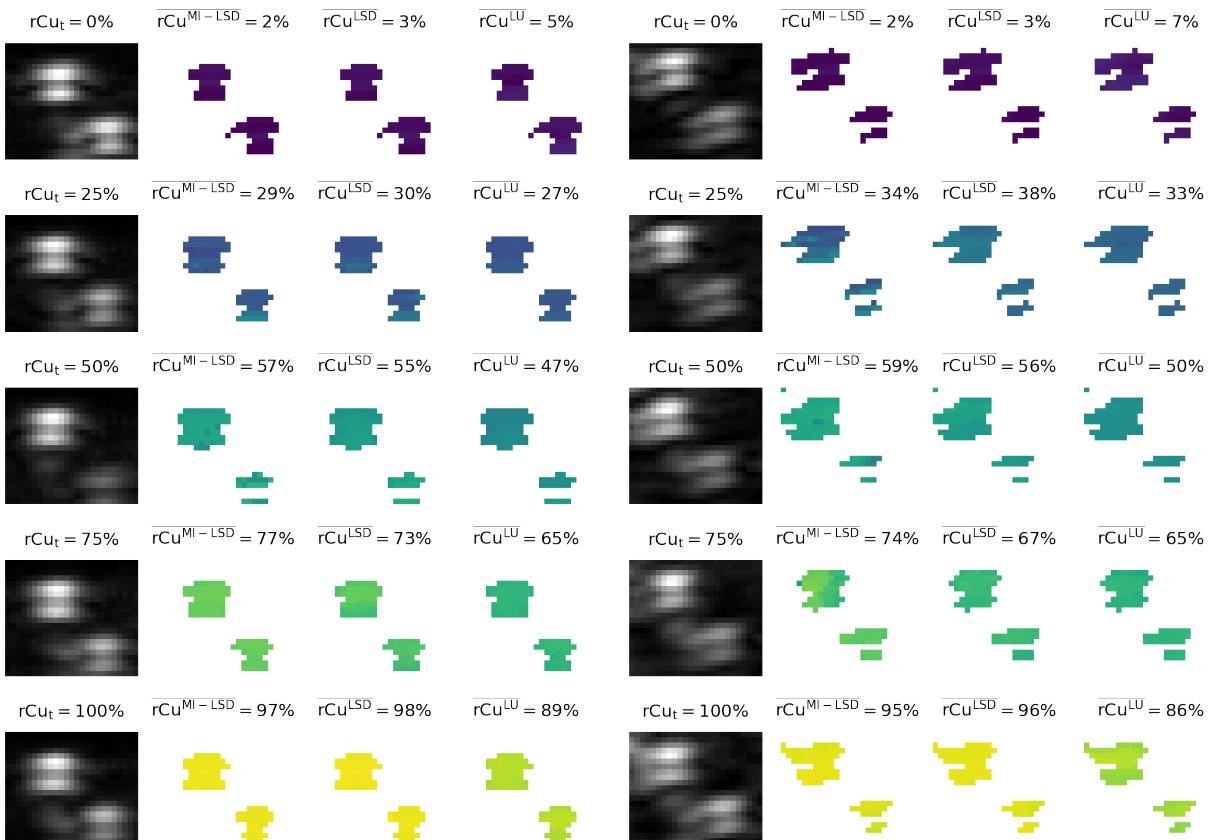


Figure 14:  $rCu_{bg} = 100\%$ , svf = 1%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

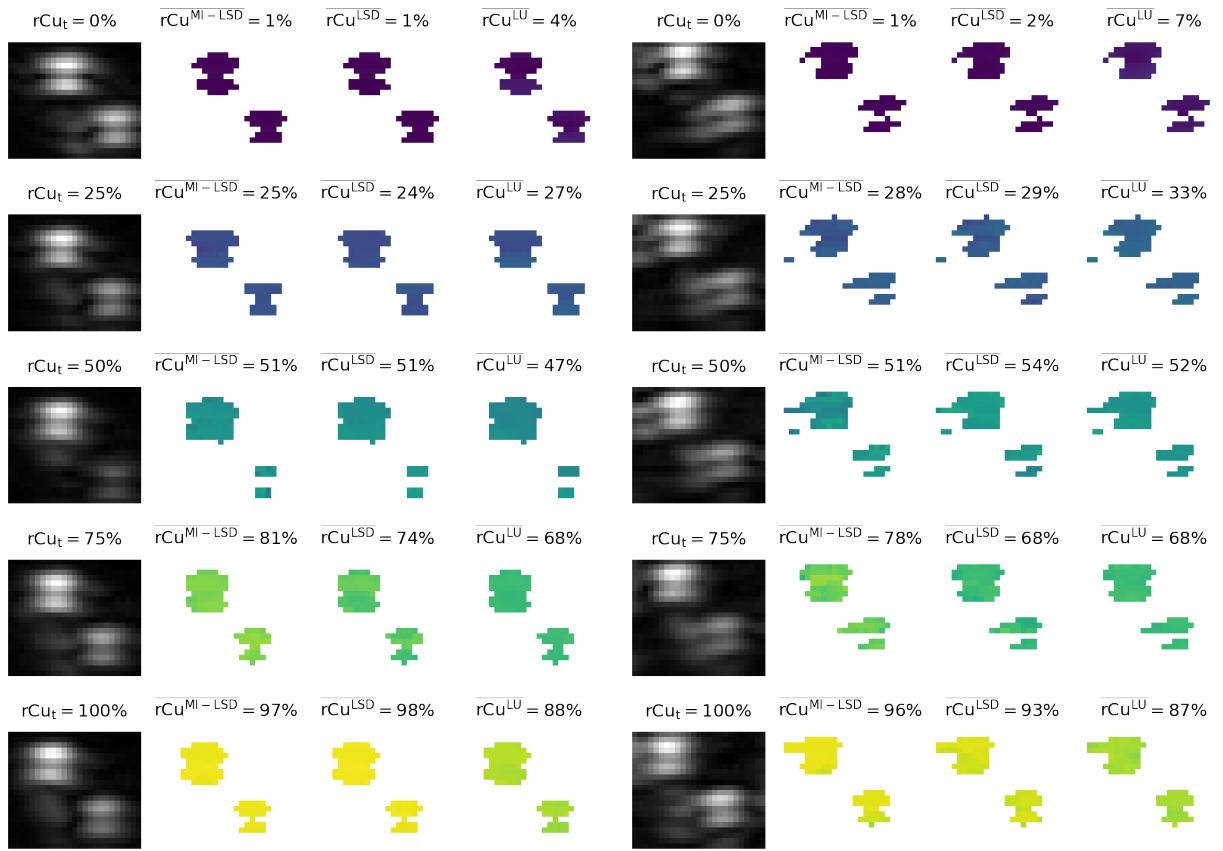


Figure 15:  $rCu_{bg} = 75\%$ , svf = 1%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

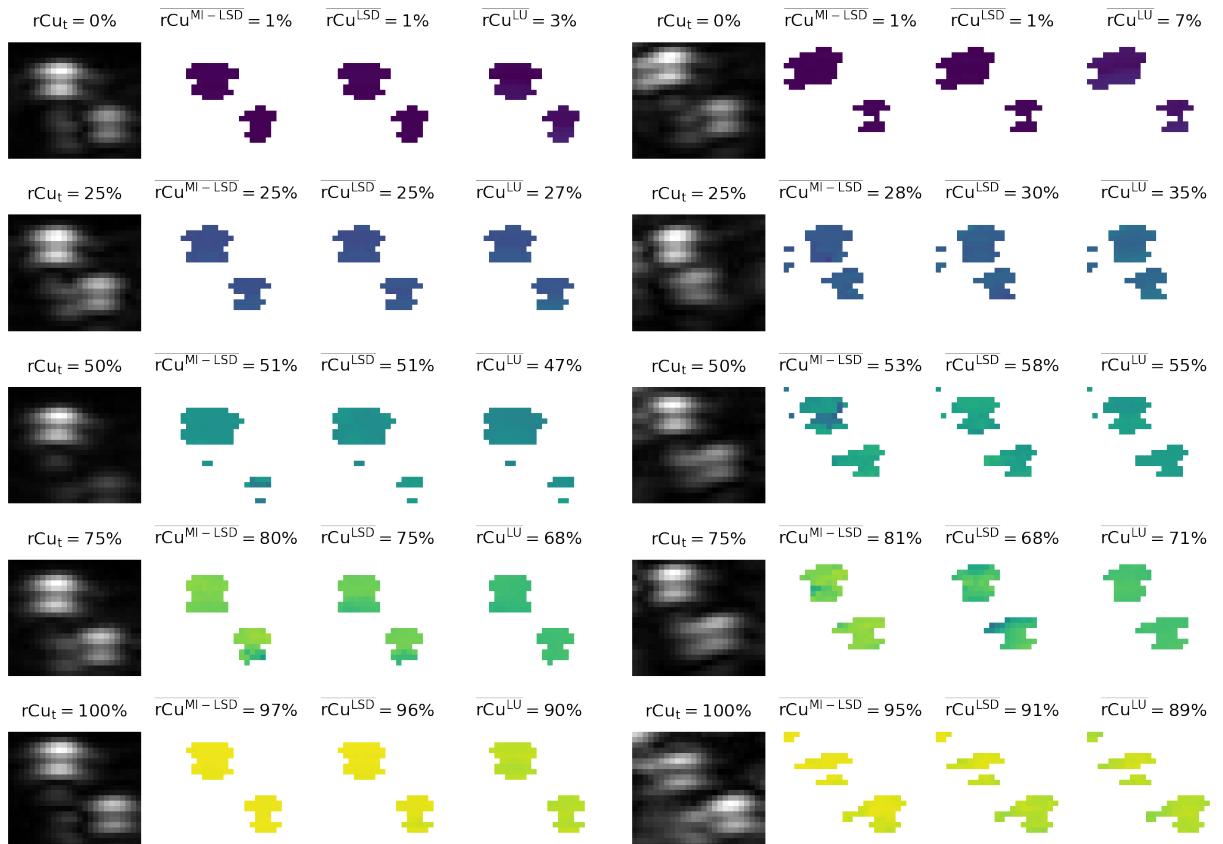


Figure 16:  $rCu_{bg} = 50\%$ , svf = 1%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

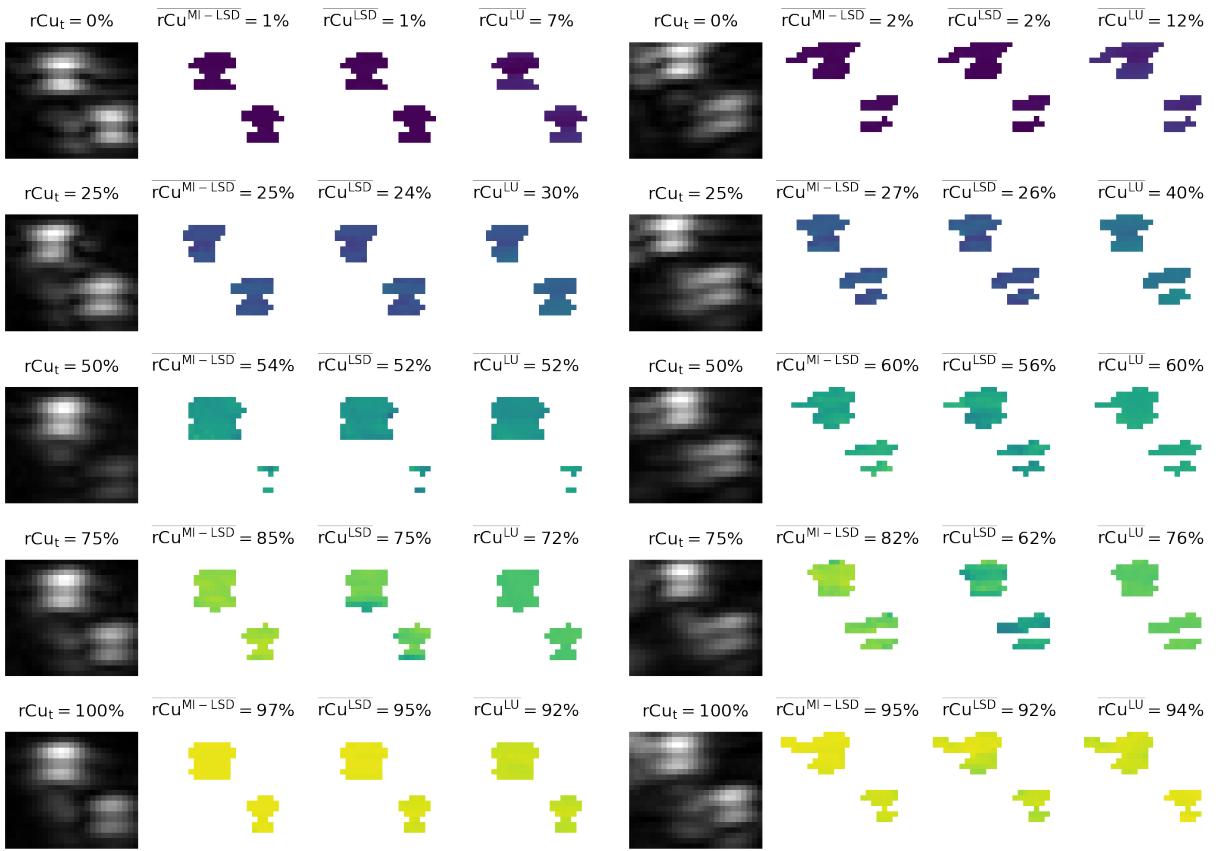


Figure 17:  $rCu_{bg} = 25\%$ , svf = 1%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

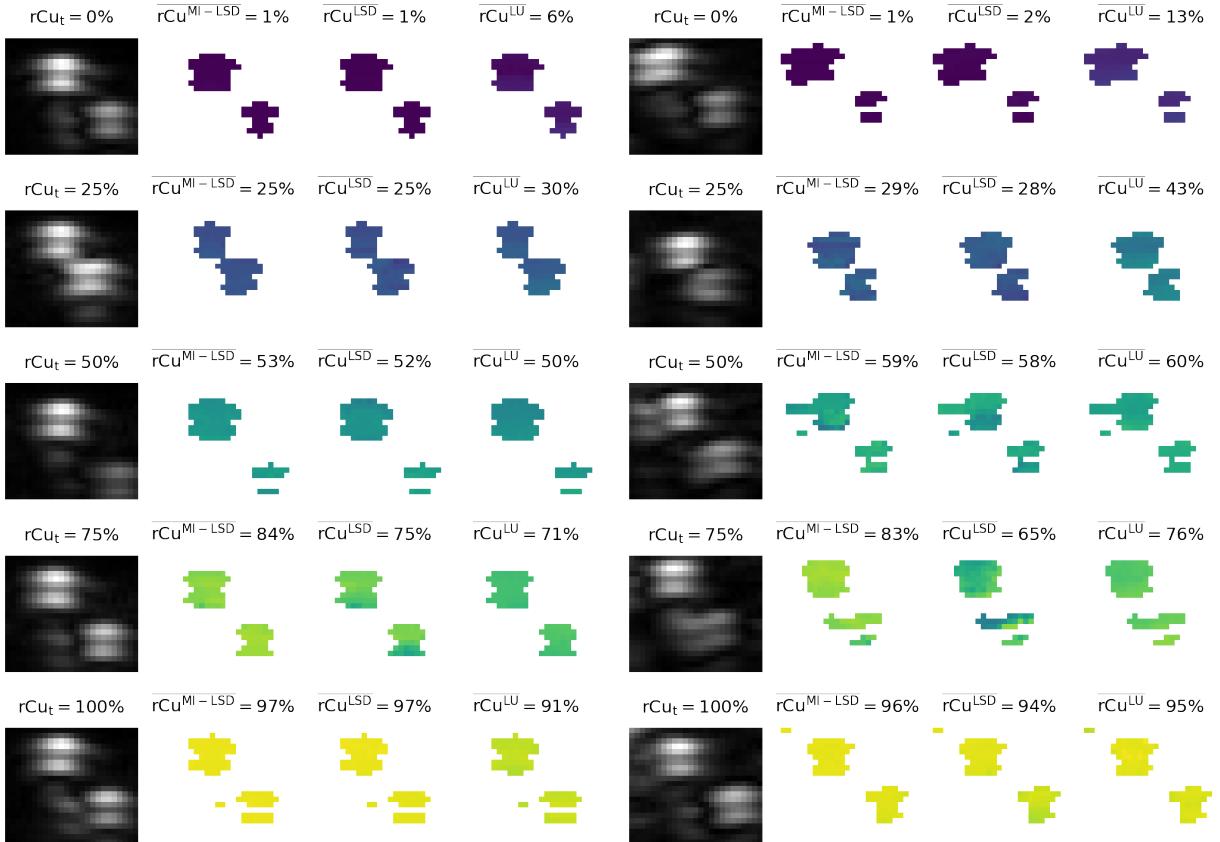


Figure 18:  $rCu_{bg} = 0\%$ , svf = 1%, RF – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

## 2.2 Feed Forward Neural Network (NN) – without dropout

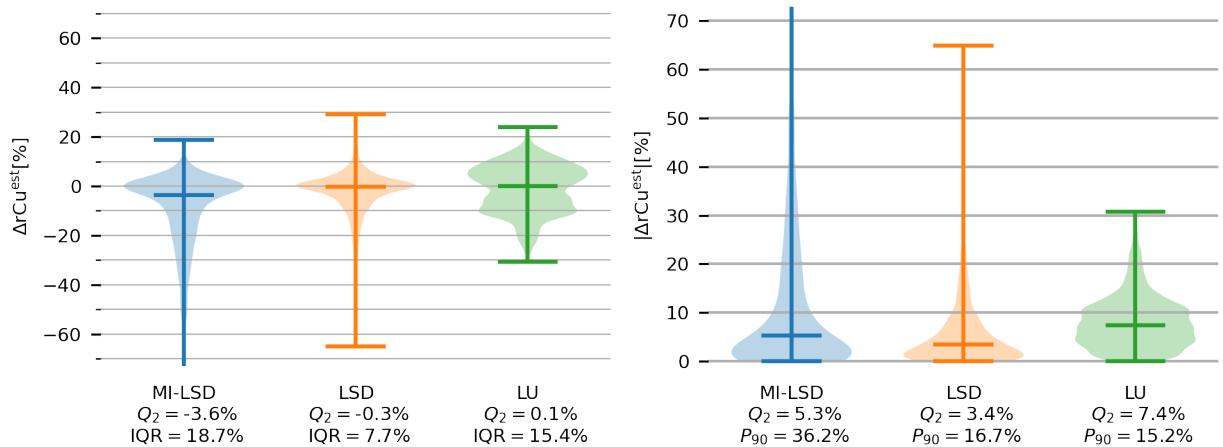


Figure 19: NN (no dropout) error distribution transversal phantom *test* set

### 2.2.0.1 Baseline – 0% sulfate volume fraction (svf)

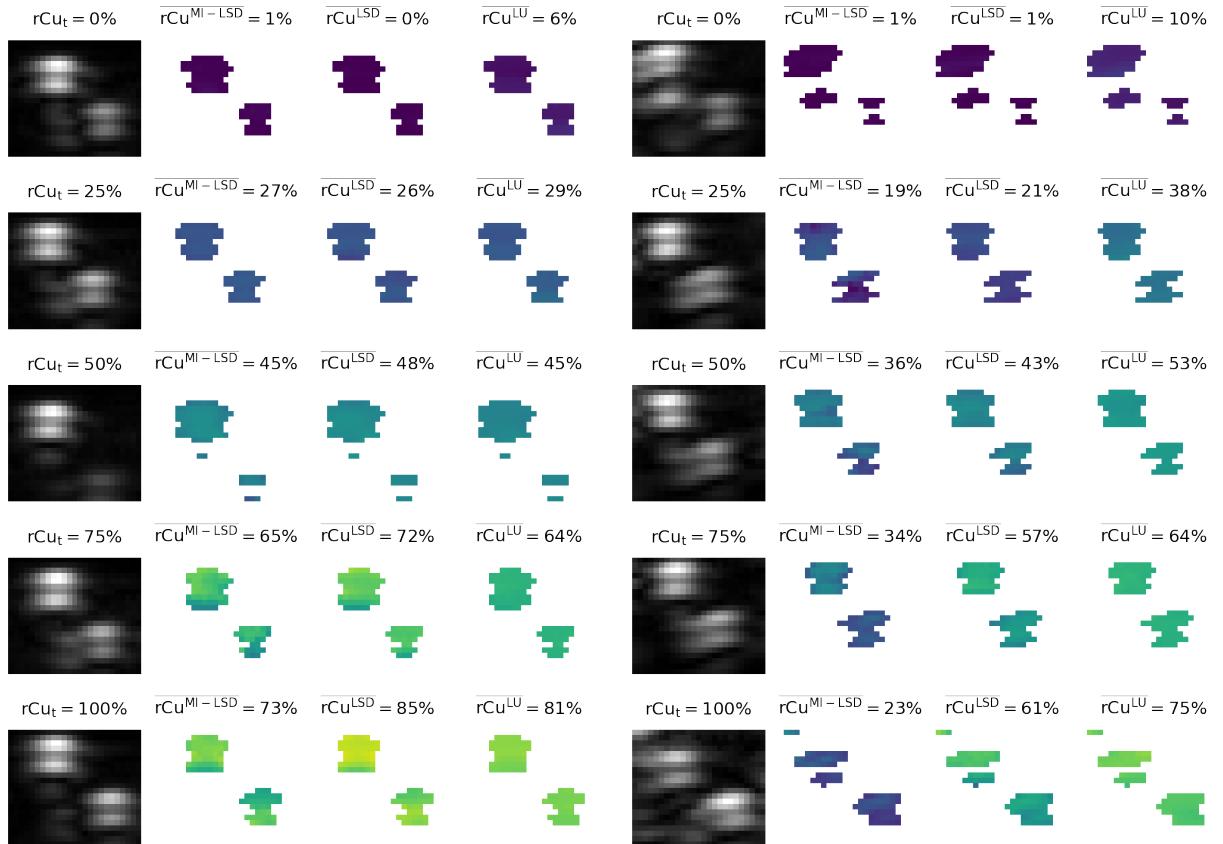


Figure 20: Baseline 0, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

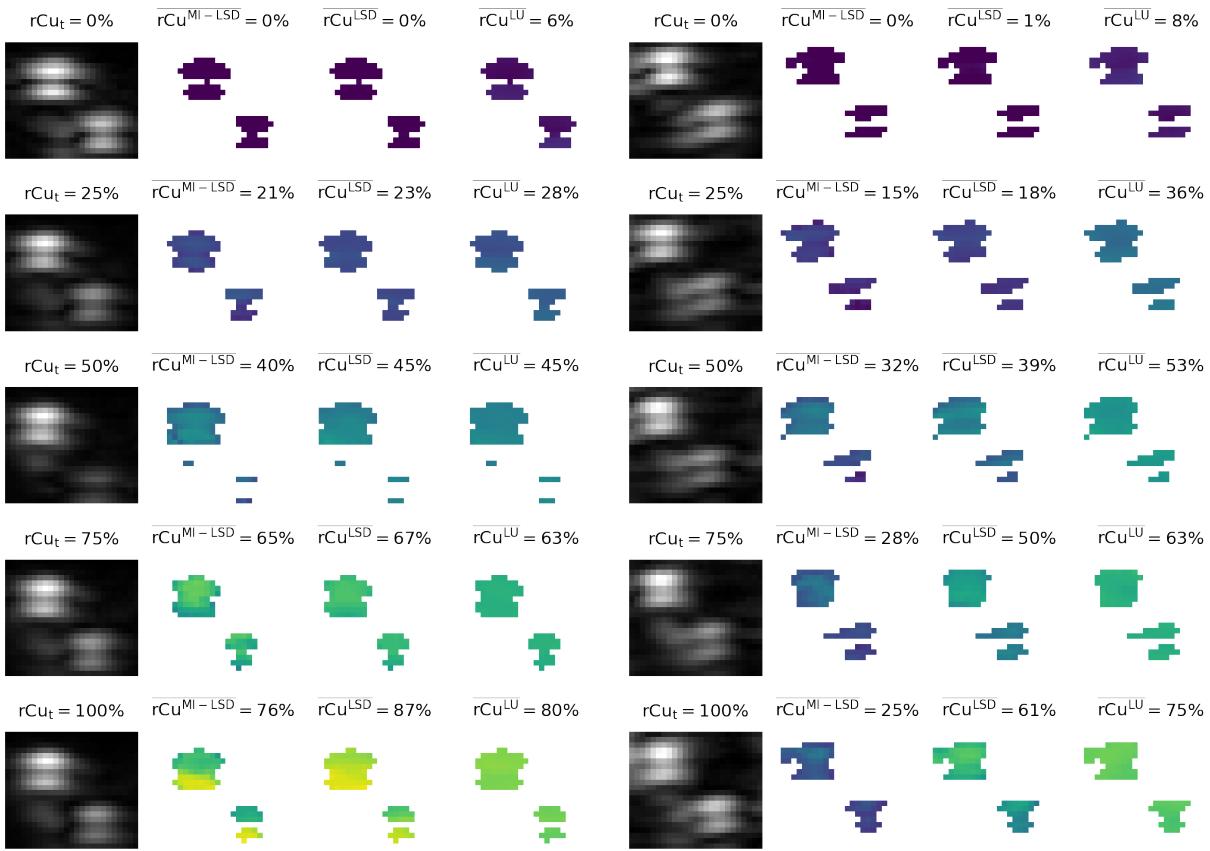


Figure 21: Baseline 1, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

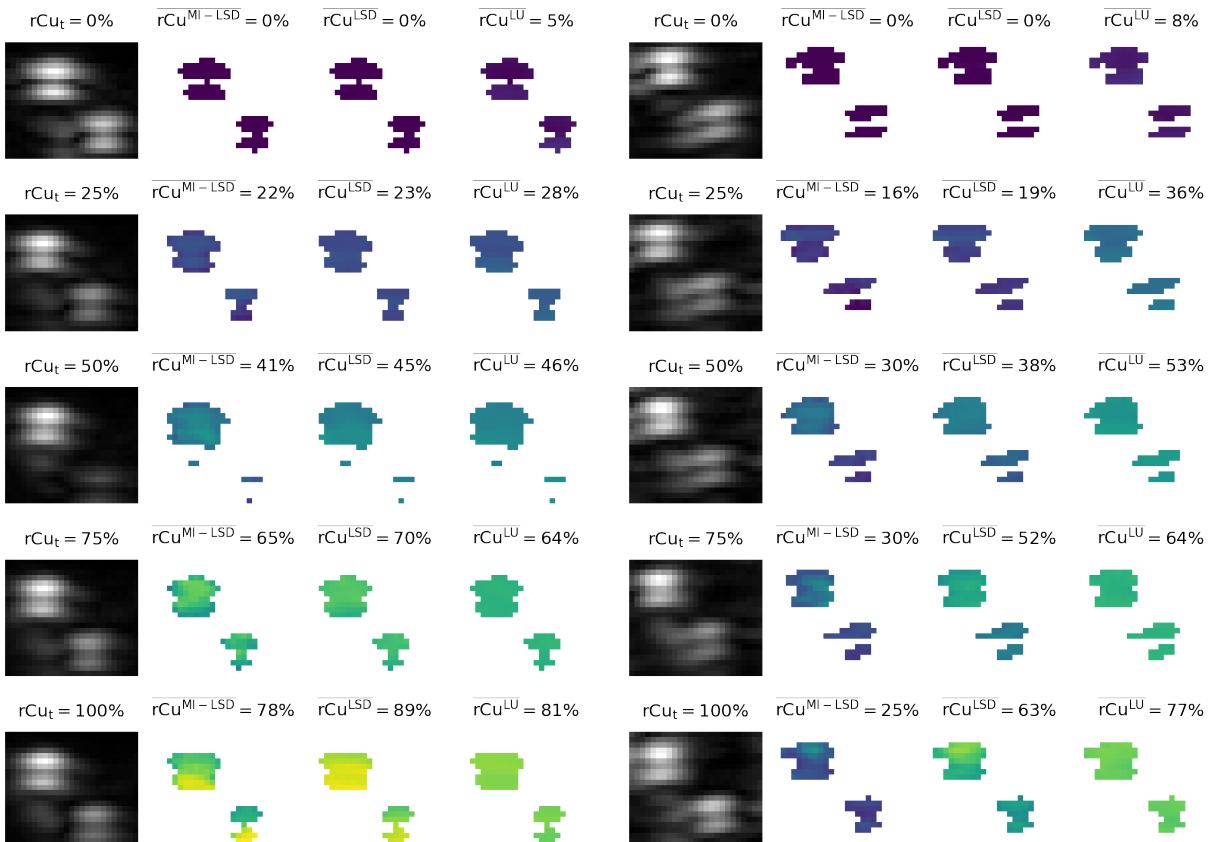


Figure 22: Baseline 2, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

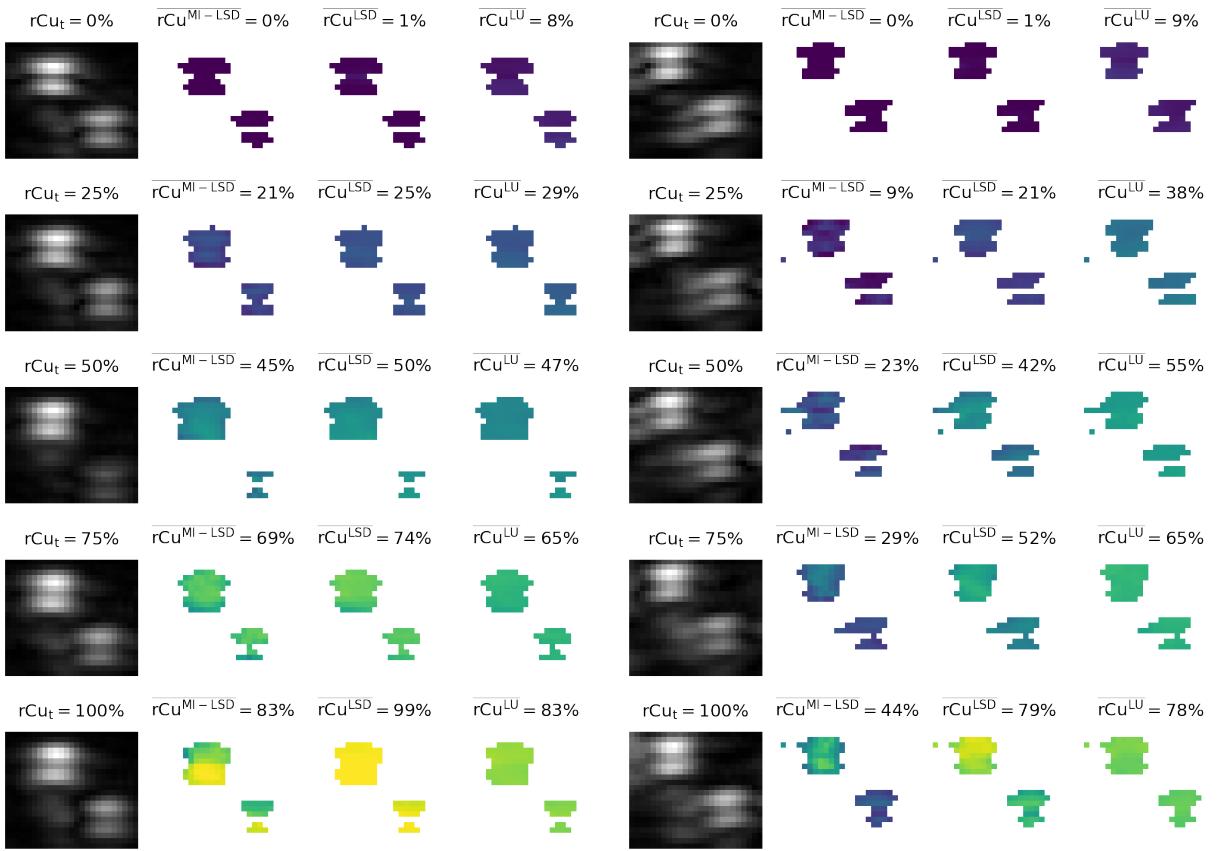


Figure 23: Baseline 3, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

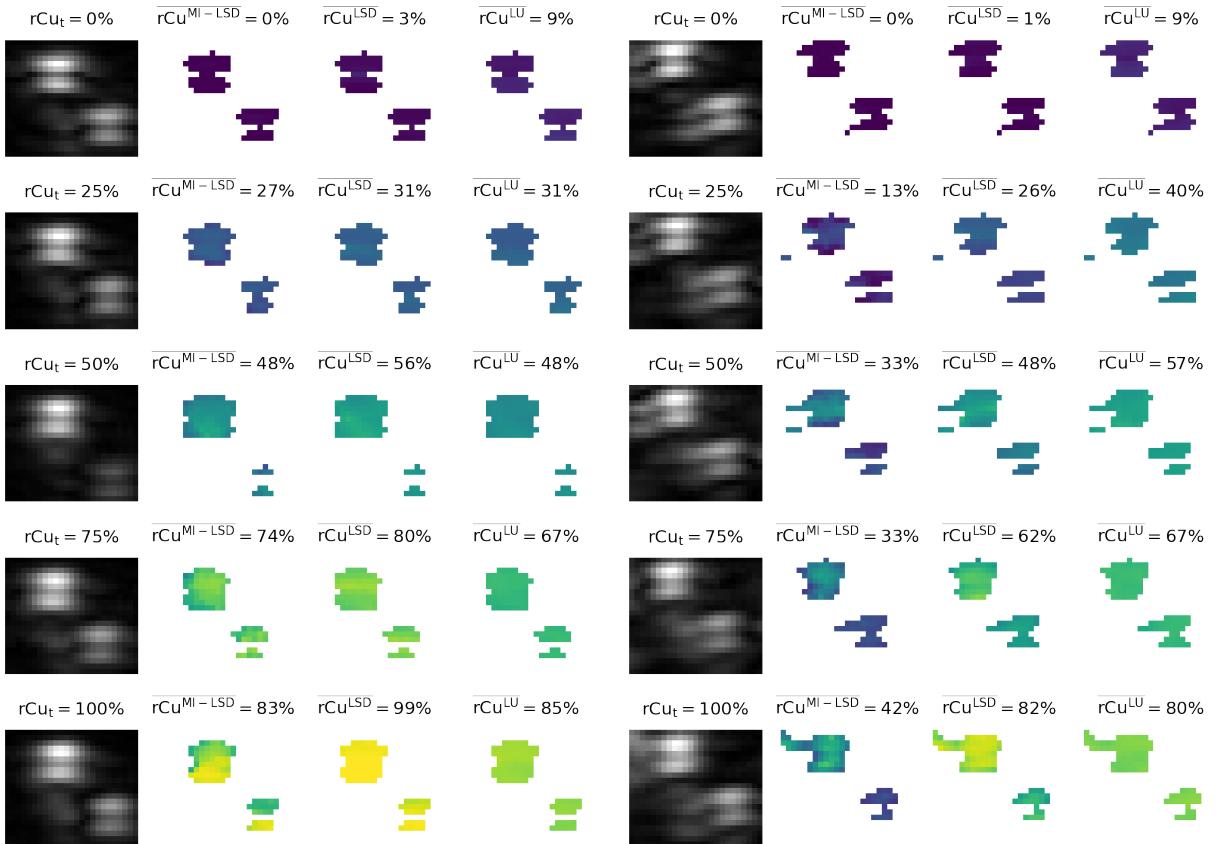


Figure 24: Baseline 4, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

### 2.2.0.2 0.5% sulfate volume fraction (svf)

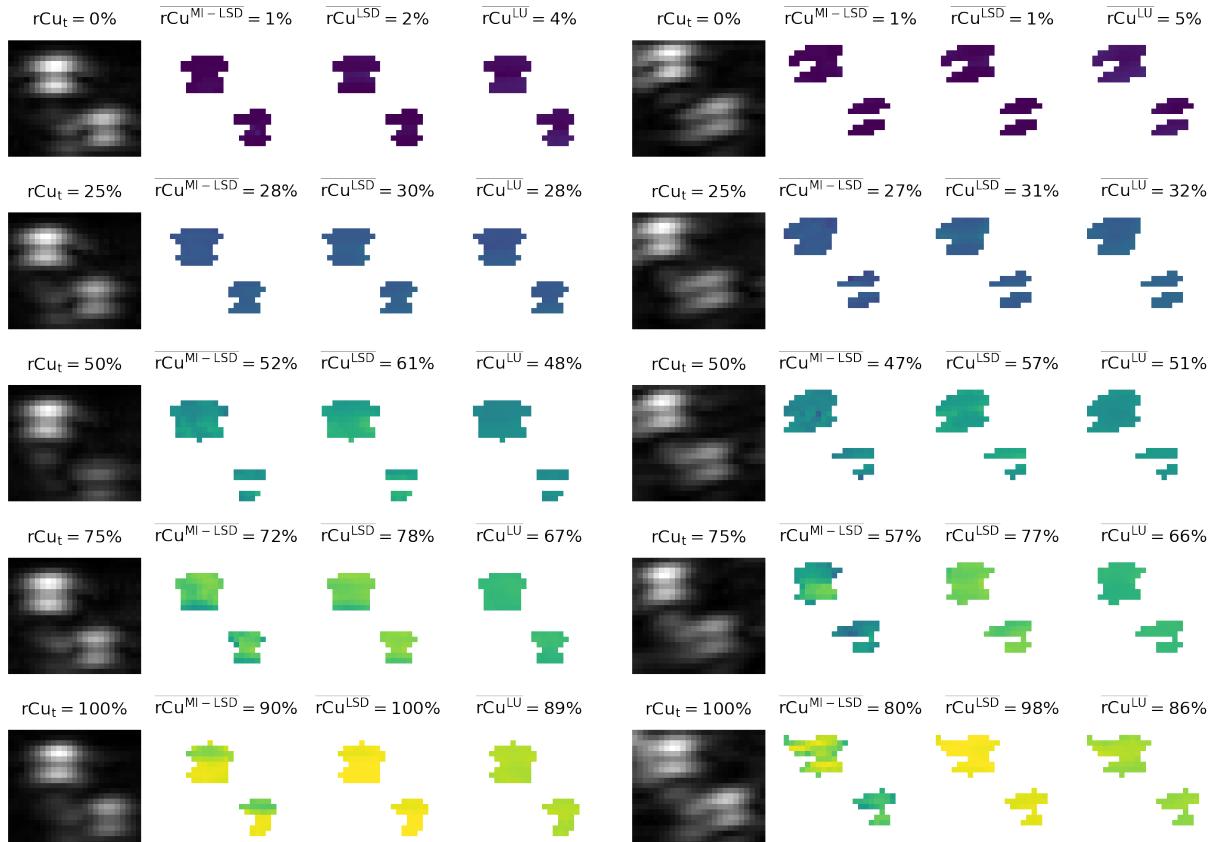


Figure 25:  $rCu_{bg} = 100\%$ ,  $svf = 0.5\%$ , NN no dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

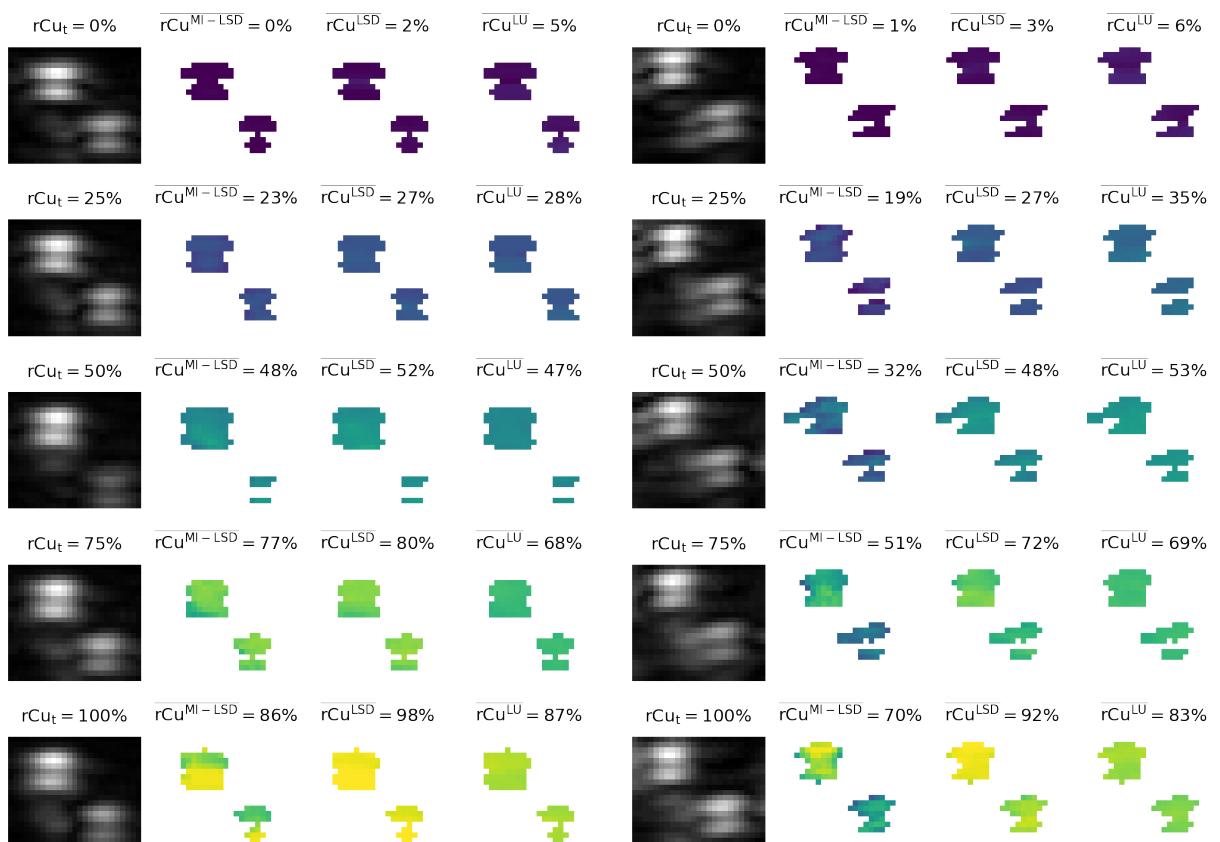


Figure 26:  $rCu_{bg} = 75\%$ ,  $svf = 0.5\%$ , NN no dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

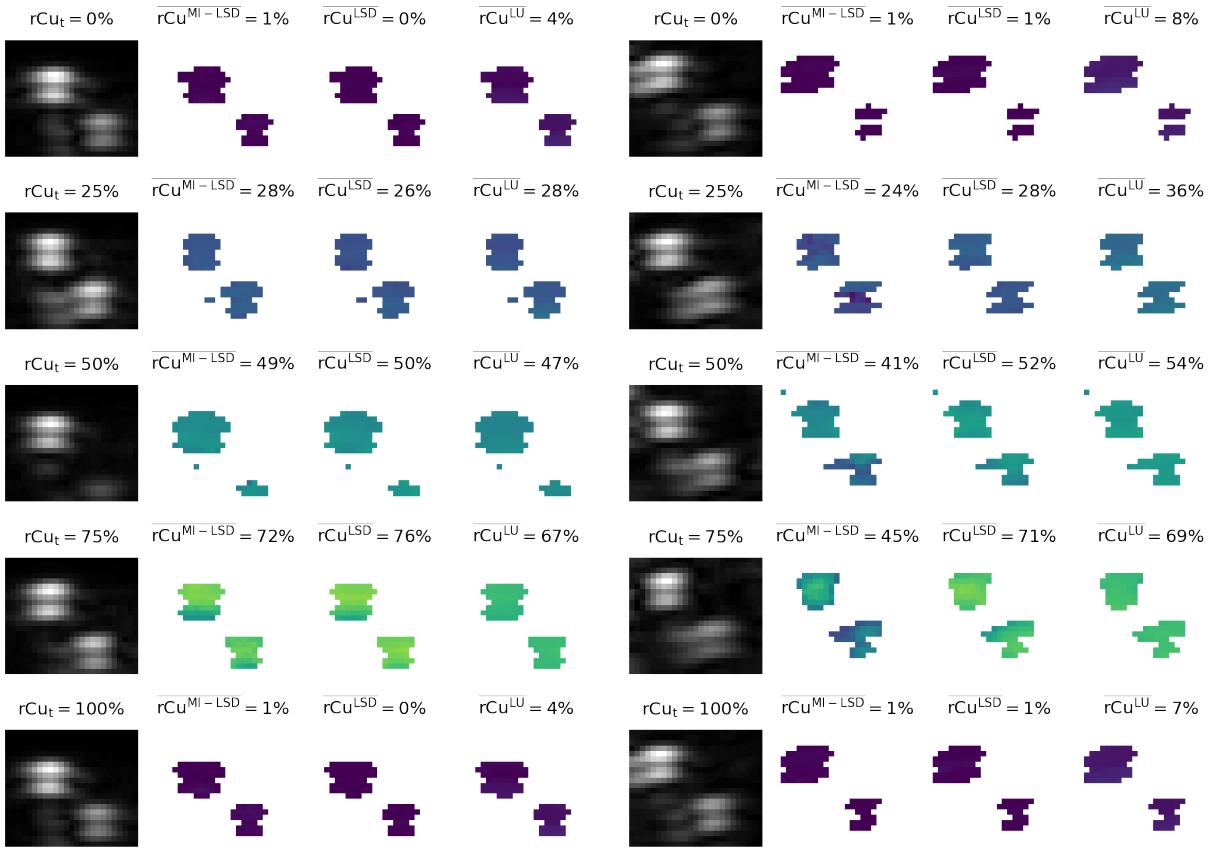


Figure 27:  $rCu_{bg} = 50\%$ , svf = 0.5%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates. Note: Due to a phantom positioning oversight, the  $rCu_t = 100\%$  measurement had an actual rCu of 0% and was omitted from further analysis.

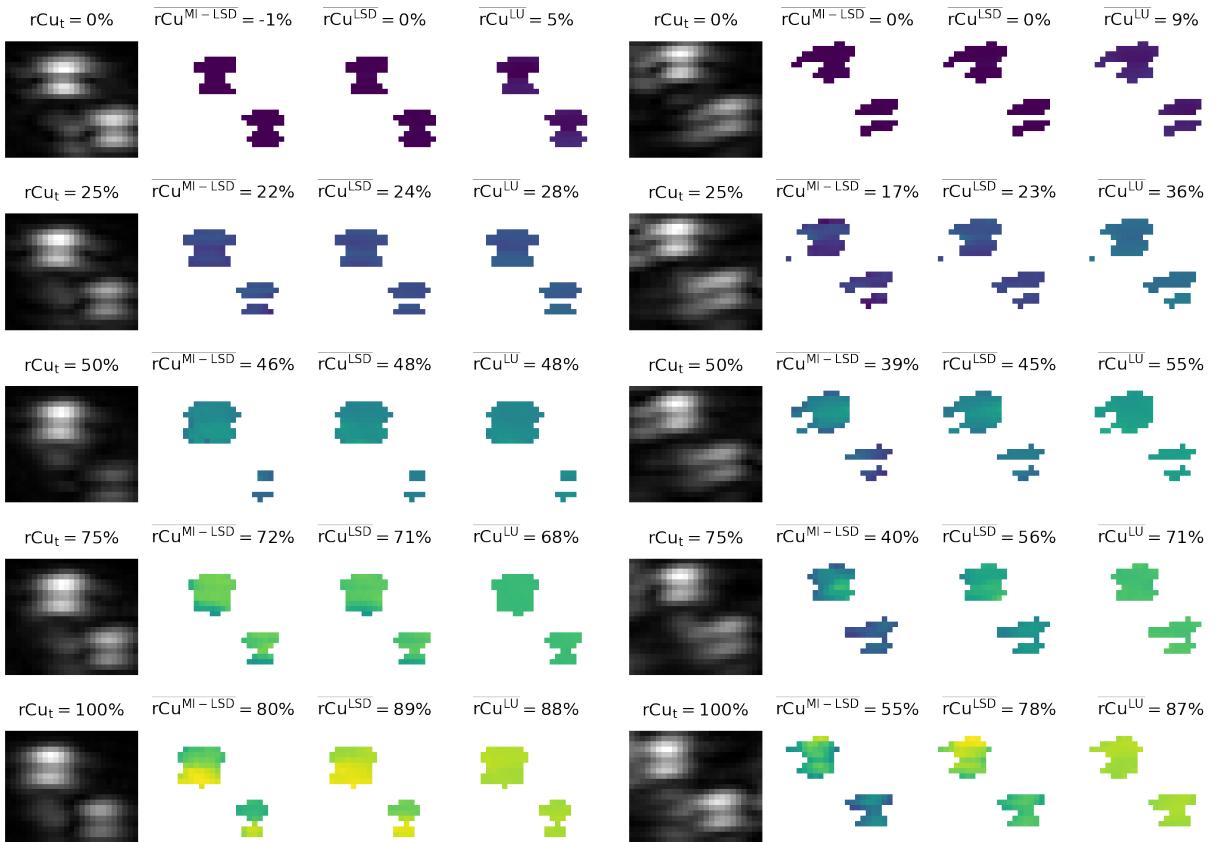


Figure 28:  $rCu_{bg} = 25\%$ , svf = 0.5%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

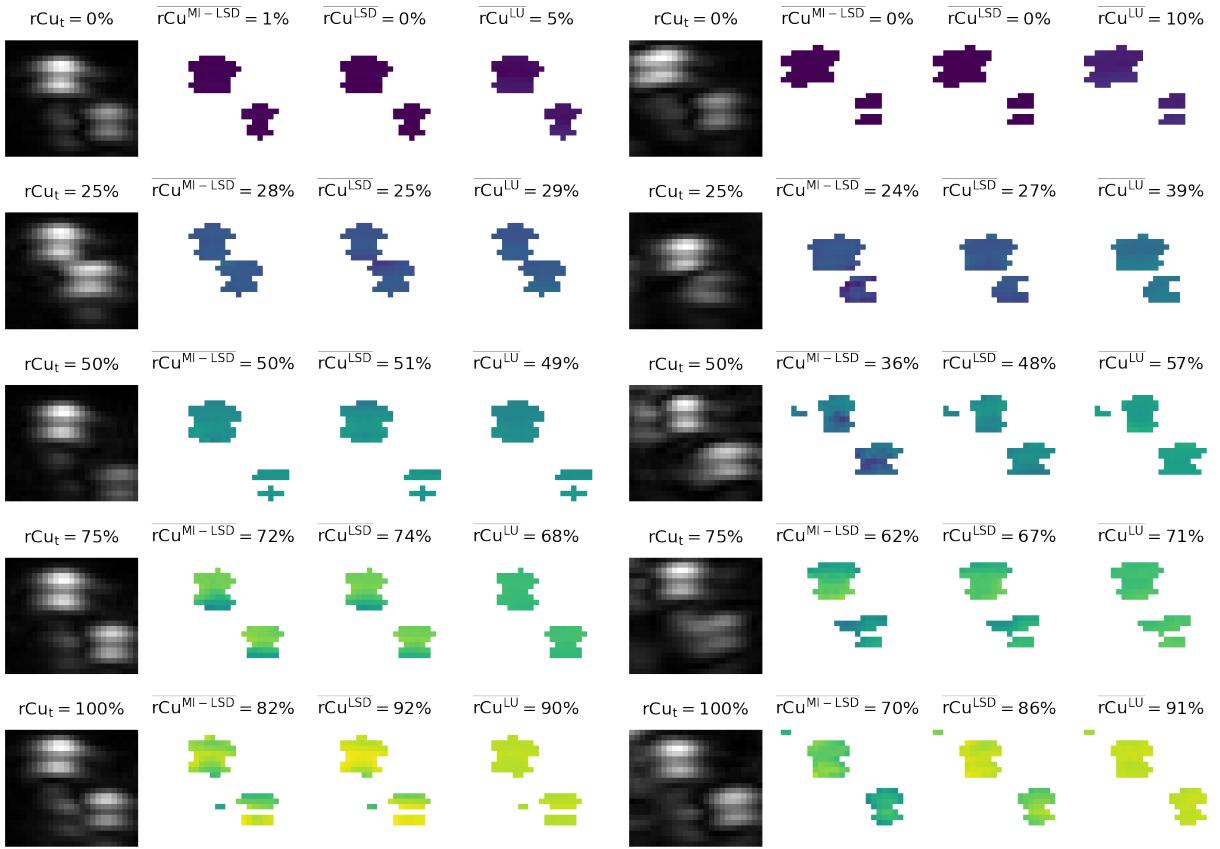


Figure 29:  $rCu_{bg} = 0\%$ , svf = 0.5%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

### 2.2.0.3 1.0% sulfate volume fraction (svf)

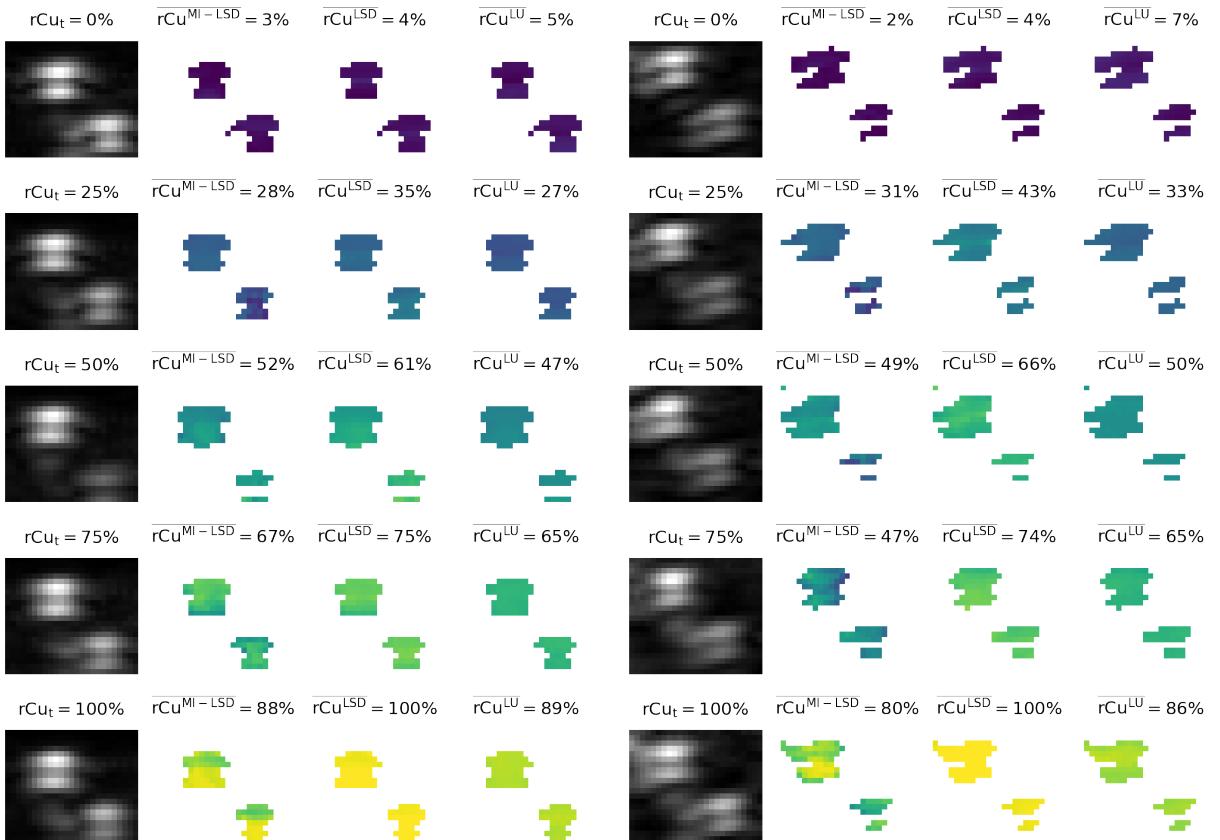


Figure 30:  $rCu_{bg} = 100\%$ , svf = 1%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

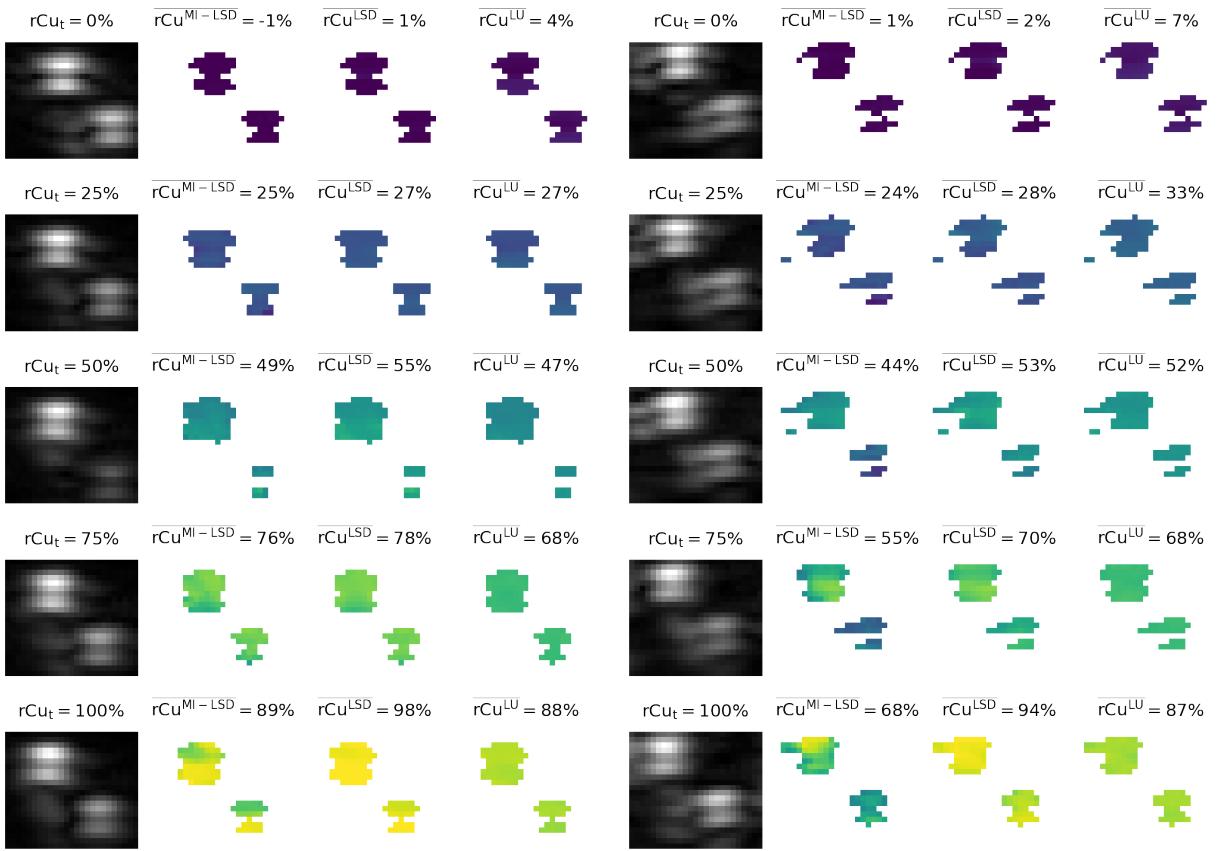


Figure 31:  $rCu_{bg} = 75\%$ , svf = 1%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

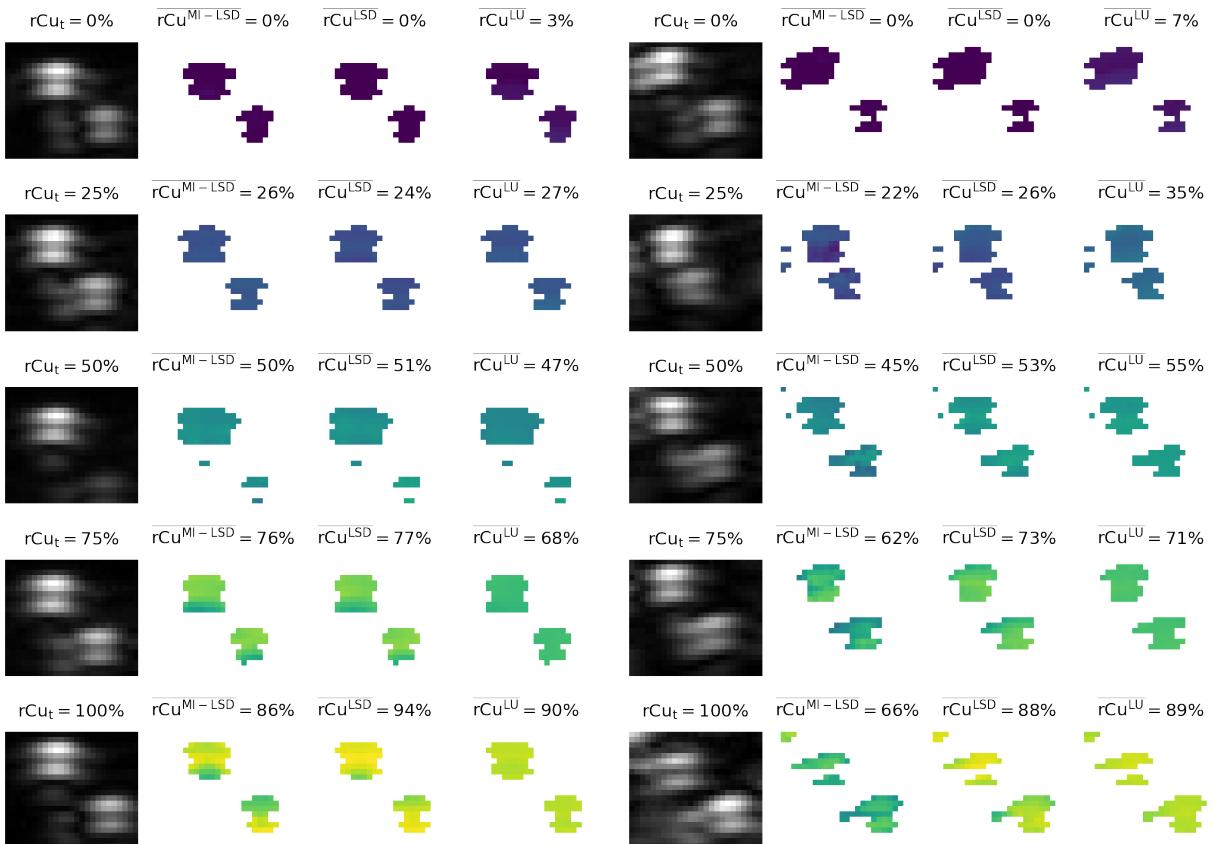


Figure 32:  $rCu_{bg} = 50\%$ , svf = 1%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

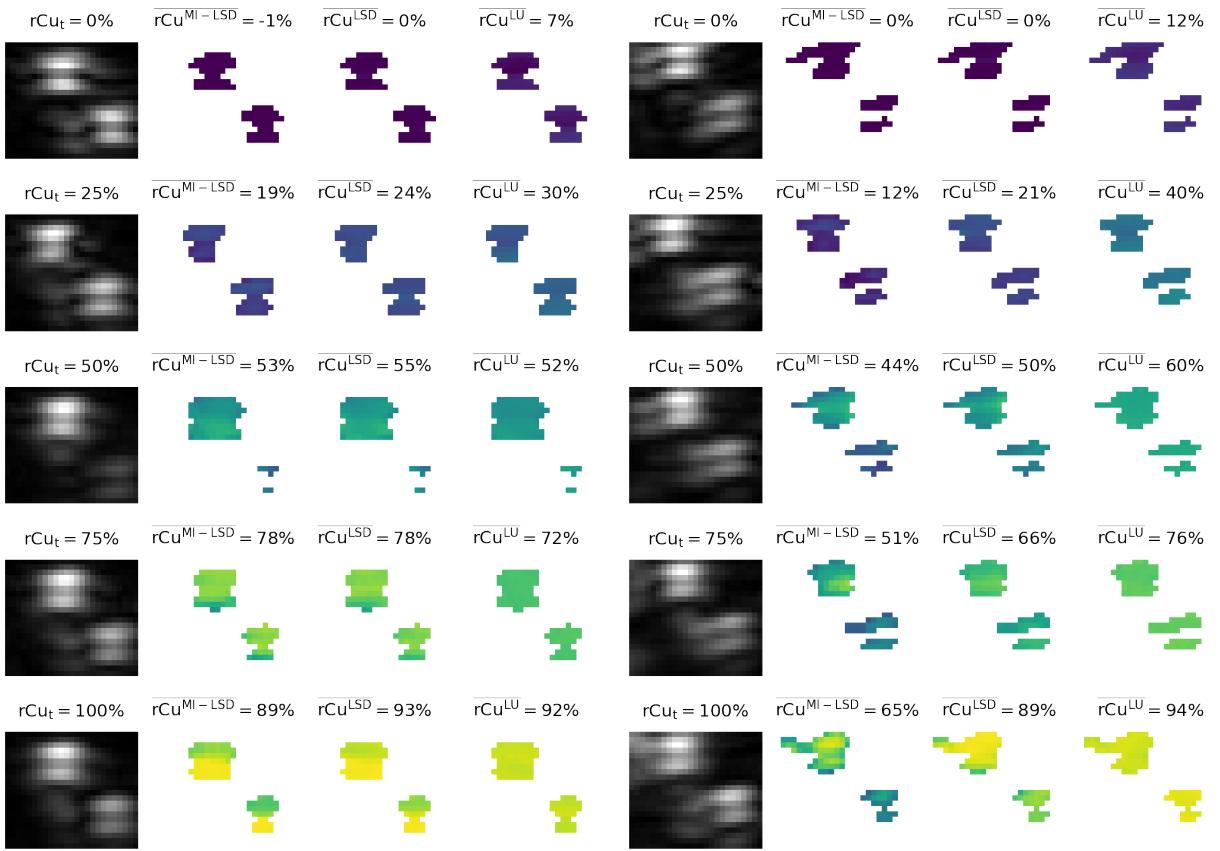


Figure 33:  $rCu_{bg} = 25\%$ , svf = 1%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

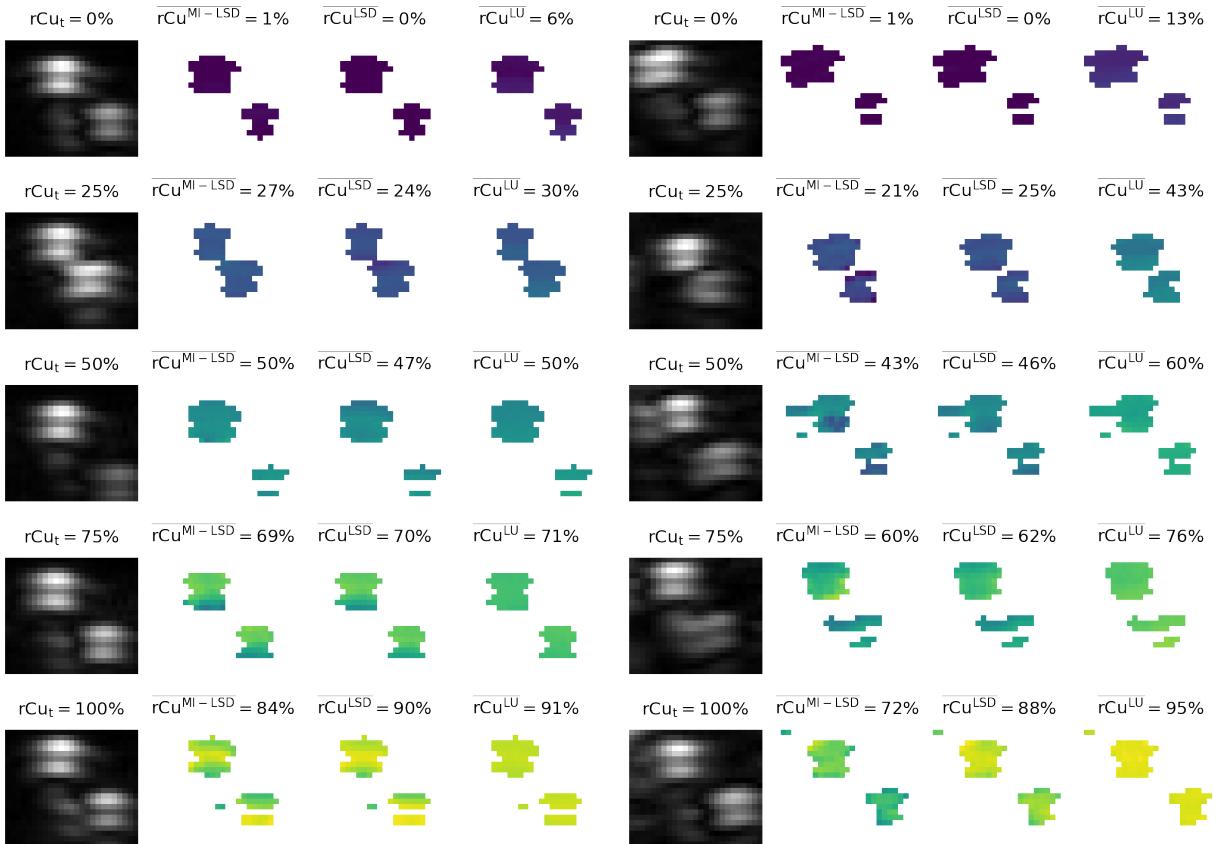


Figure 34:  $rCu_{bg} = 0\%$ , svf = 1%, NN no dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

## 2.3 Feed Forward Neural Network (NN) – with dropout

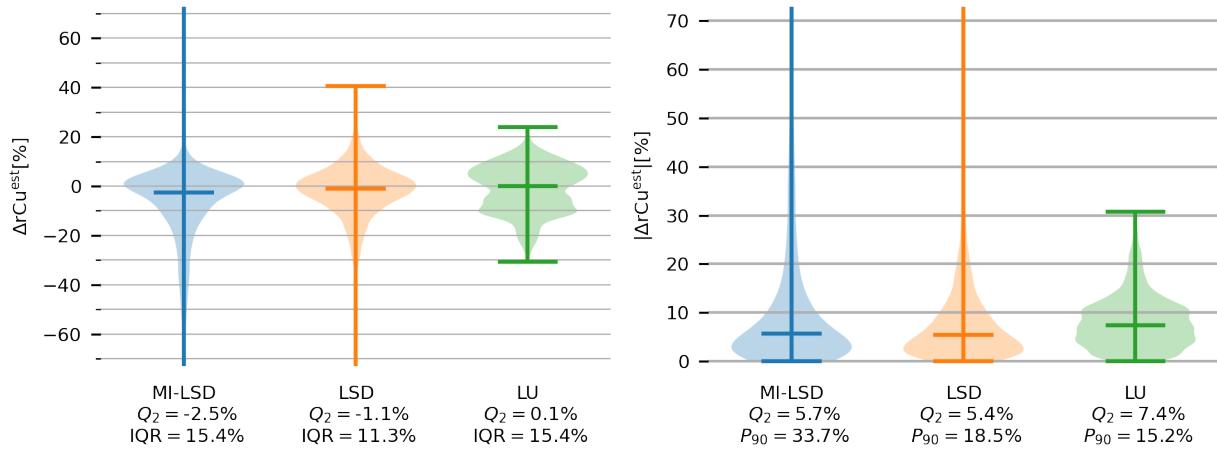


Figure 35: NN (with dropout) error distribution transversal phantom *test* set

### 2.3.0.1 Baseline – 0% sulfate volume fraction (svf)

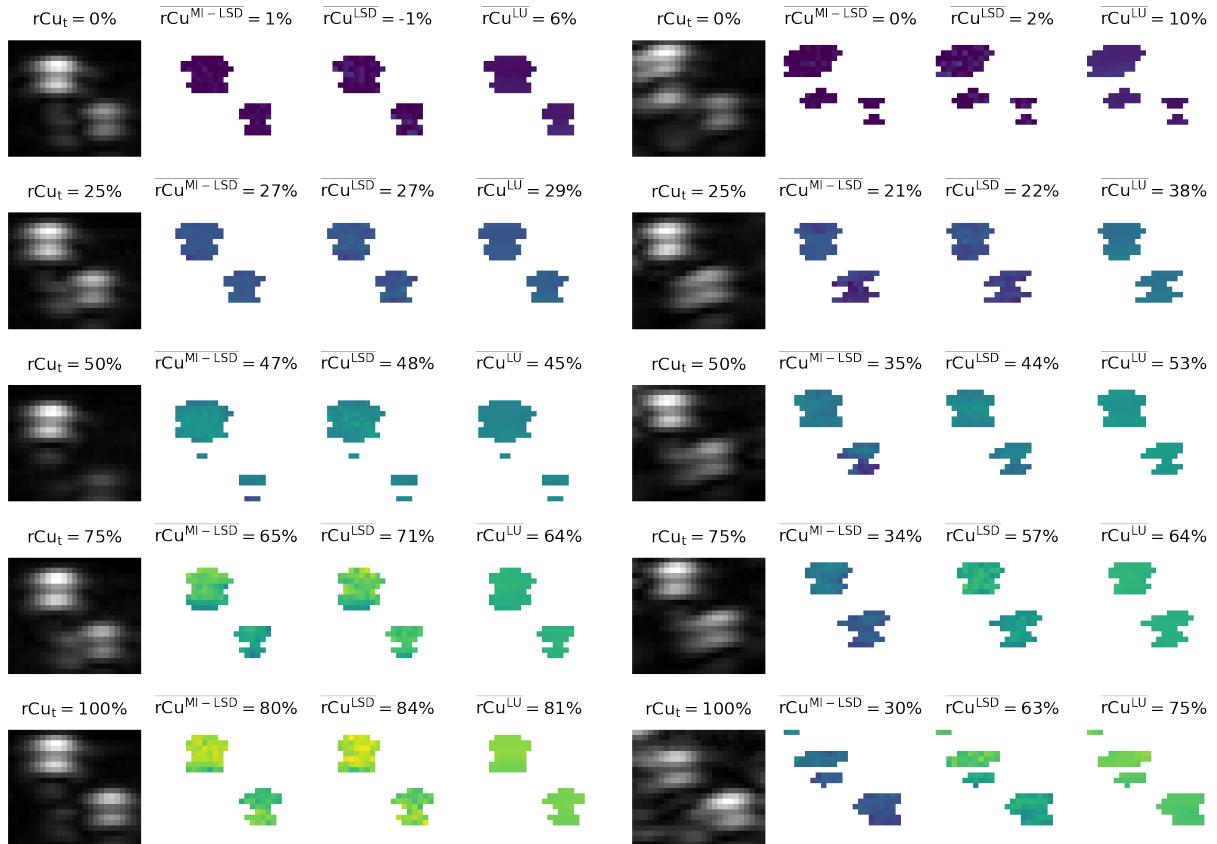


Figure 36: Baseline 0, NN with dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

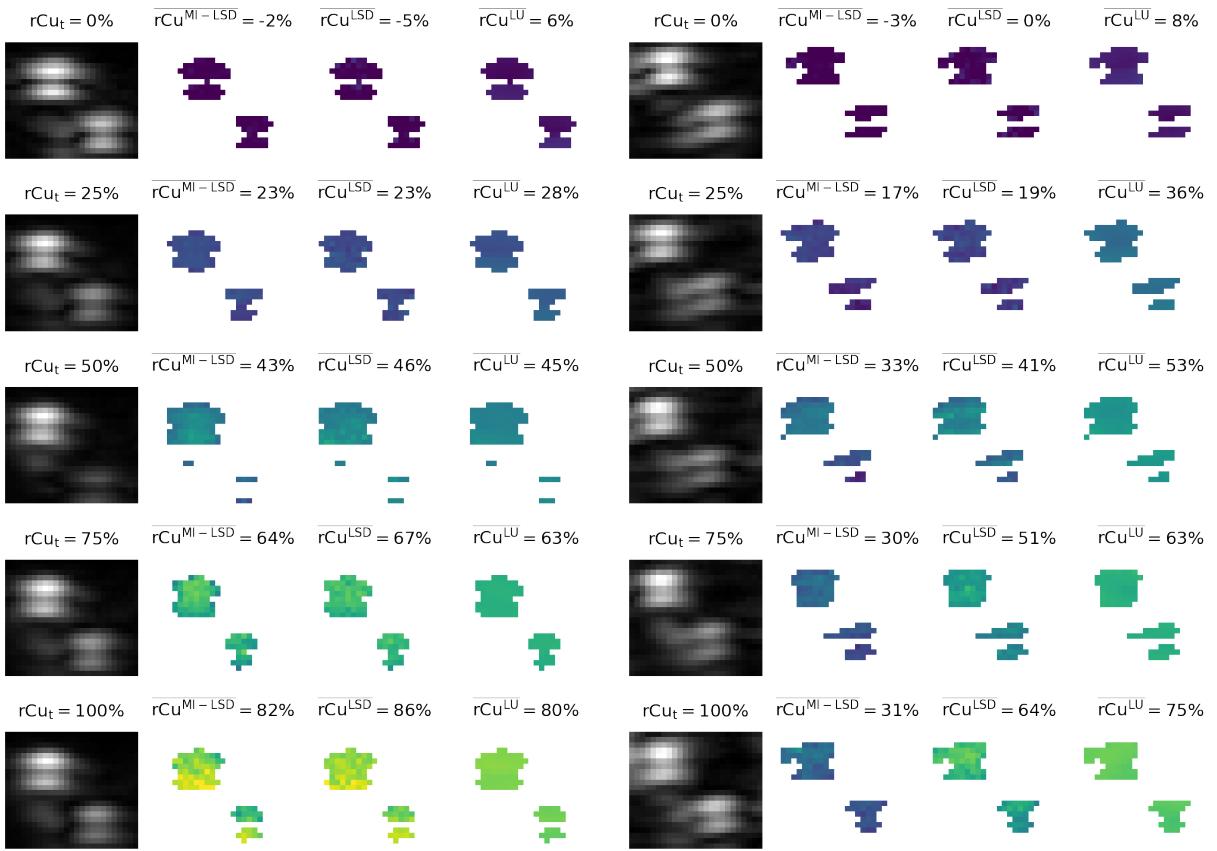


Figure 37: Baseline 1, NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

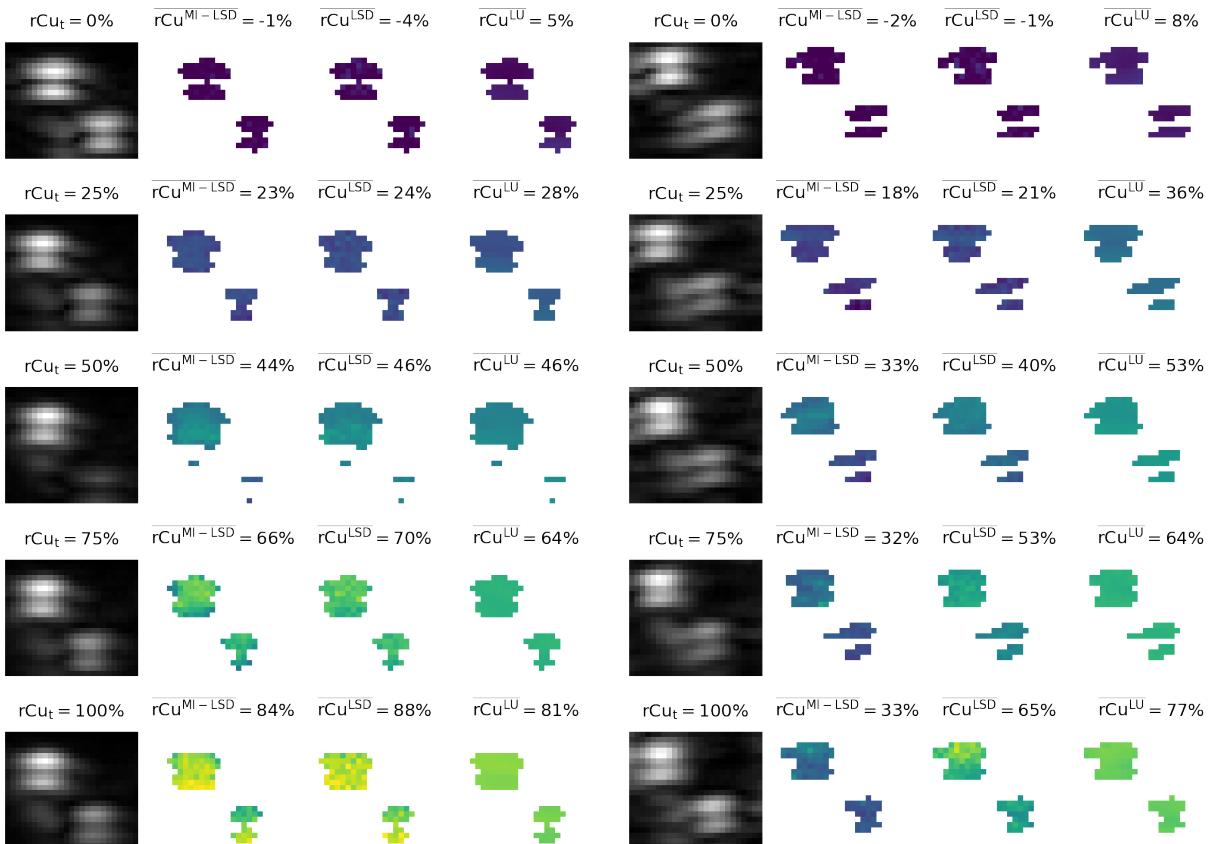


Figure 38: Baseline 2, NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

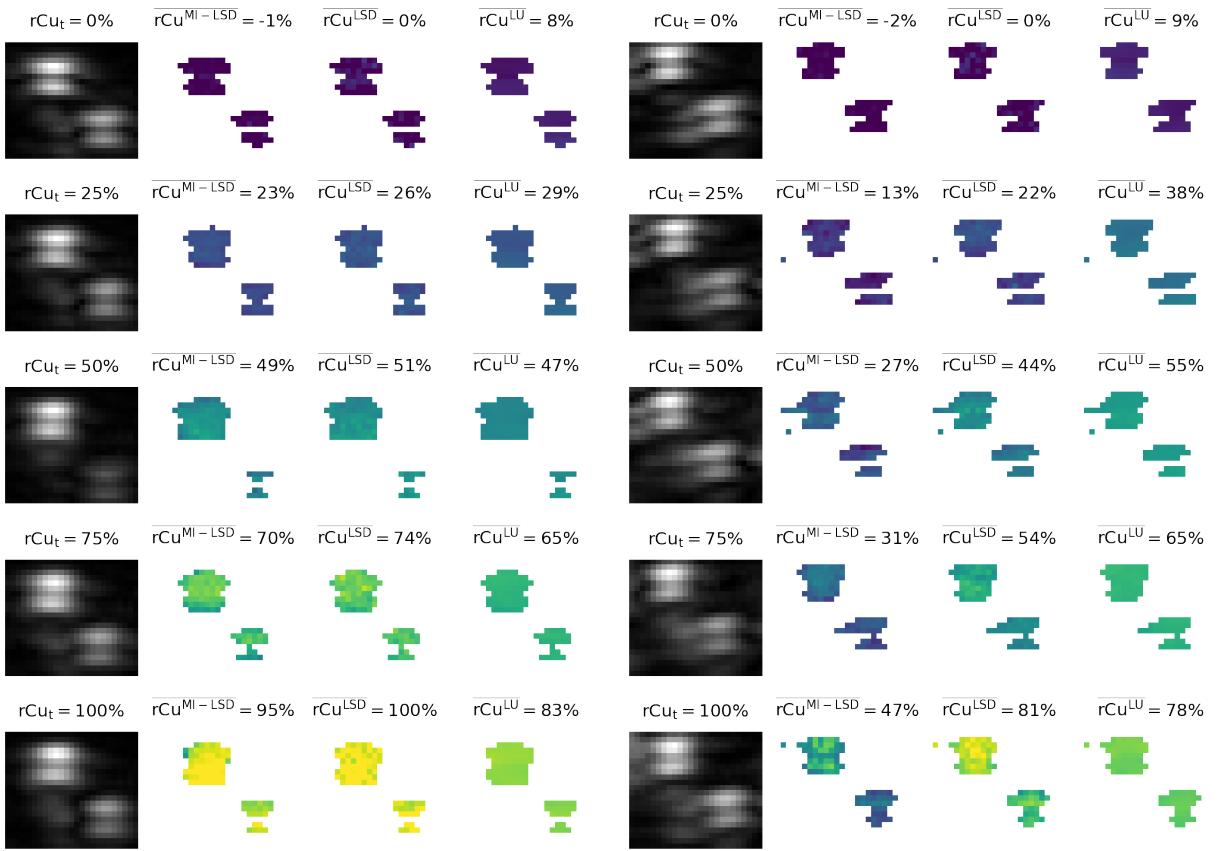


Figure 39: Baseline 3, NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

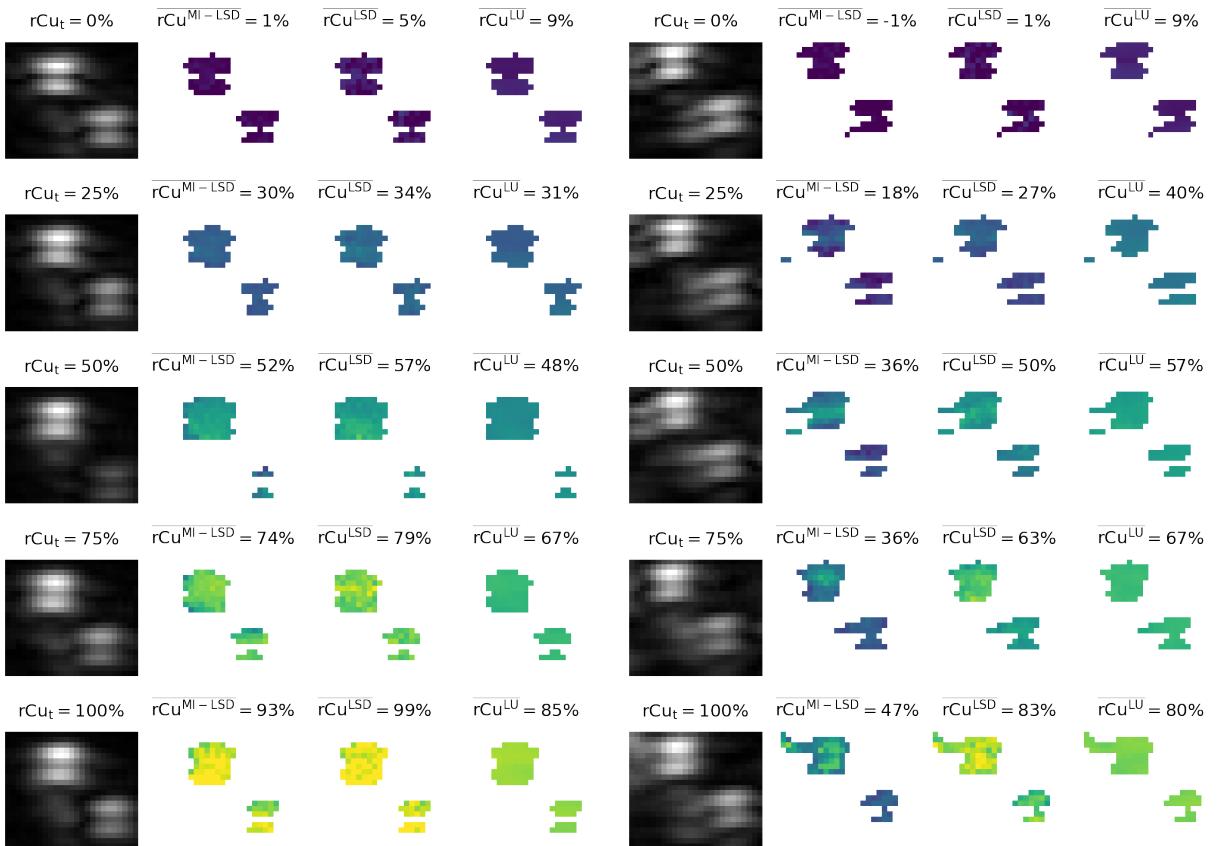


Figure 40: Baseline 4, NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

### 2.3.0.2 0.5% sulfate volume fraction (svf)

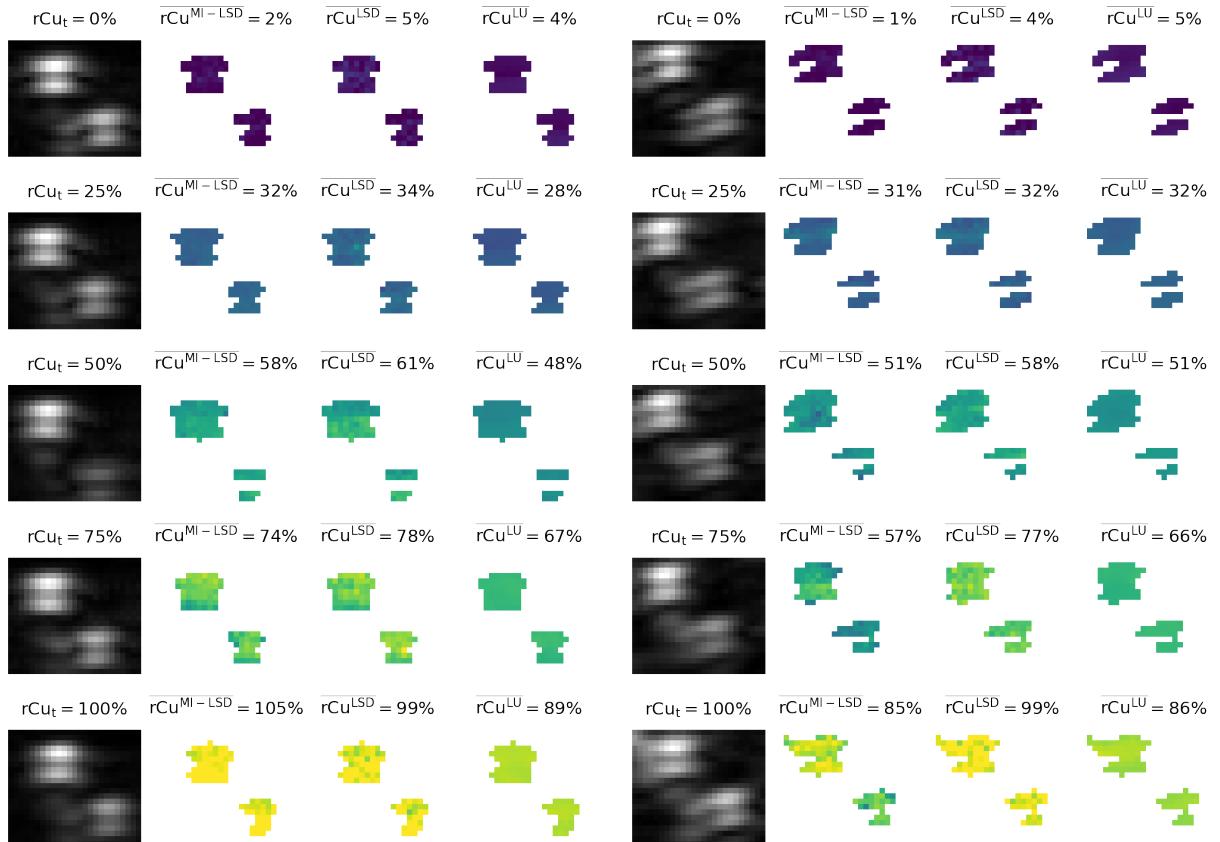


Figure 41:  $rCu_{bg} = 100\%$ ,  $svf = 0.5\%$ , NN with dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

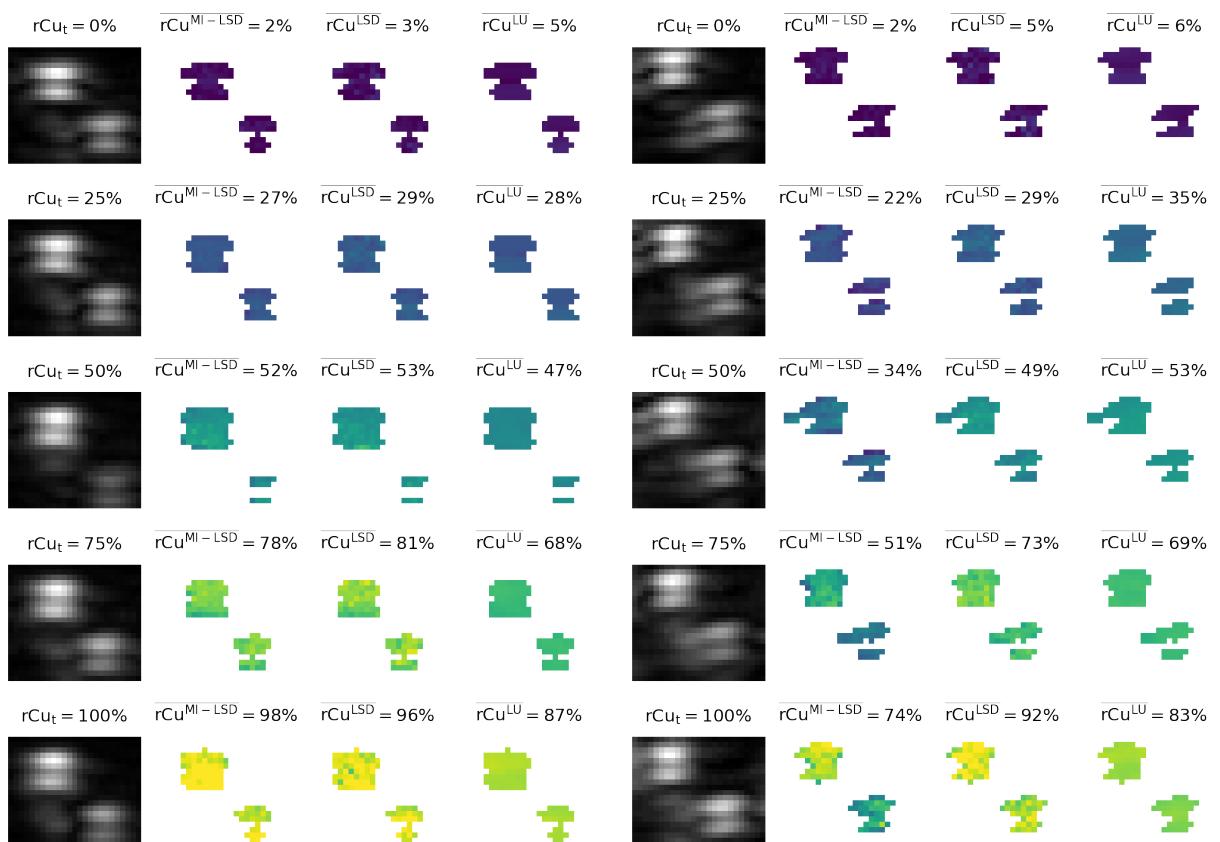


Figure 42:  $rCu_{bg} = 75\%$ ,  $svf = 0.5\%$ , NN with dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

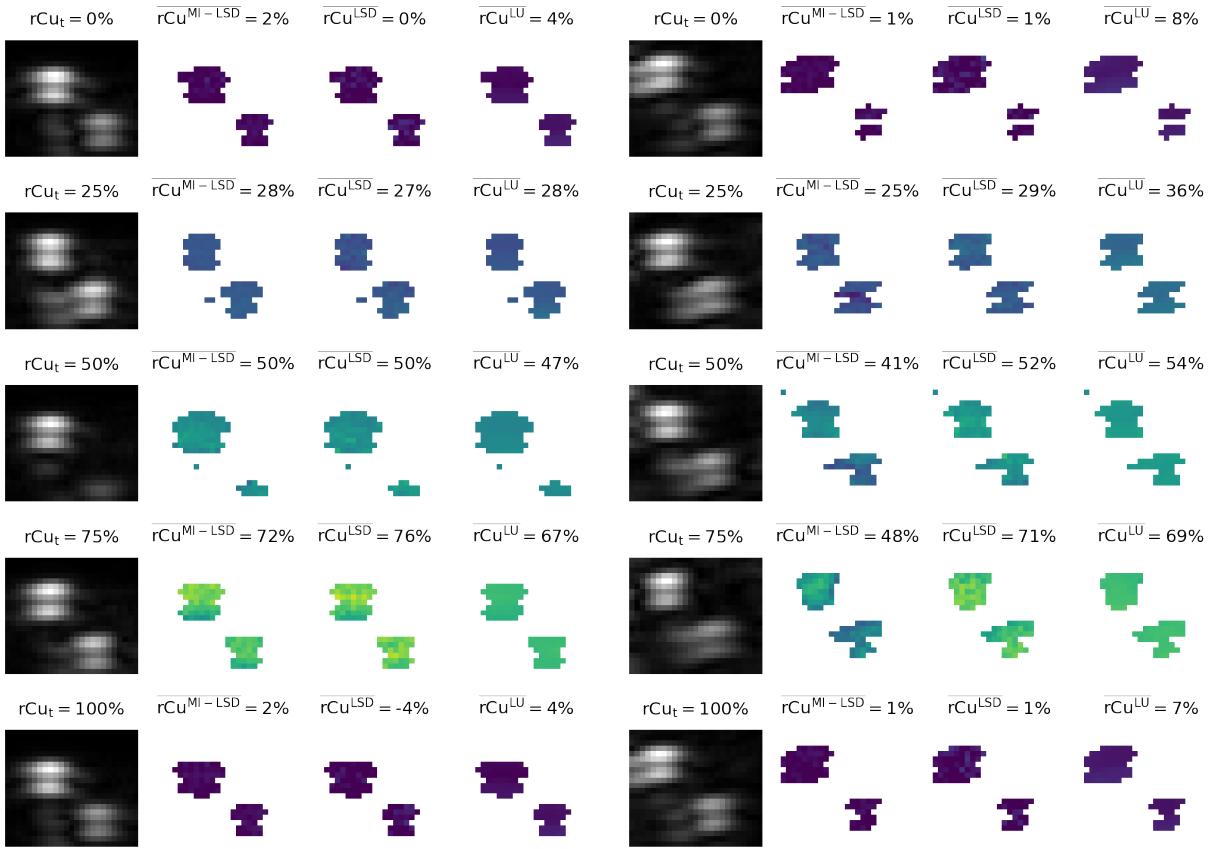


Figure 43:  $rCu_{bg} = 50\%$ ,  $svf = 0.5\%$ , NN with dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates. *Note: Due to a phantom positioning oversight, the  $rCu_t = 100\%$  measurement had an actual  $rCu$  of 0% and was omitted from further analysis.*

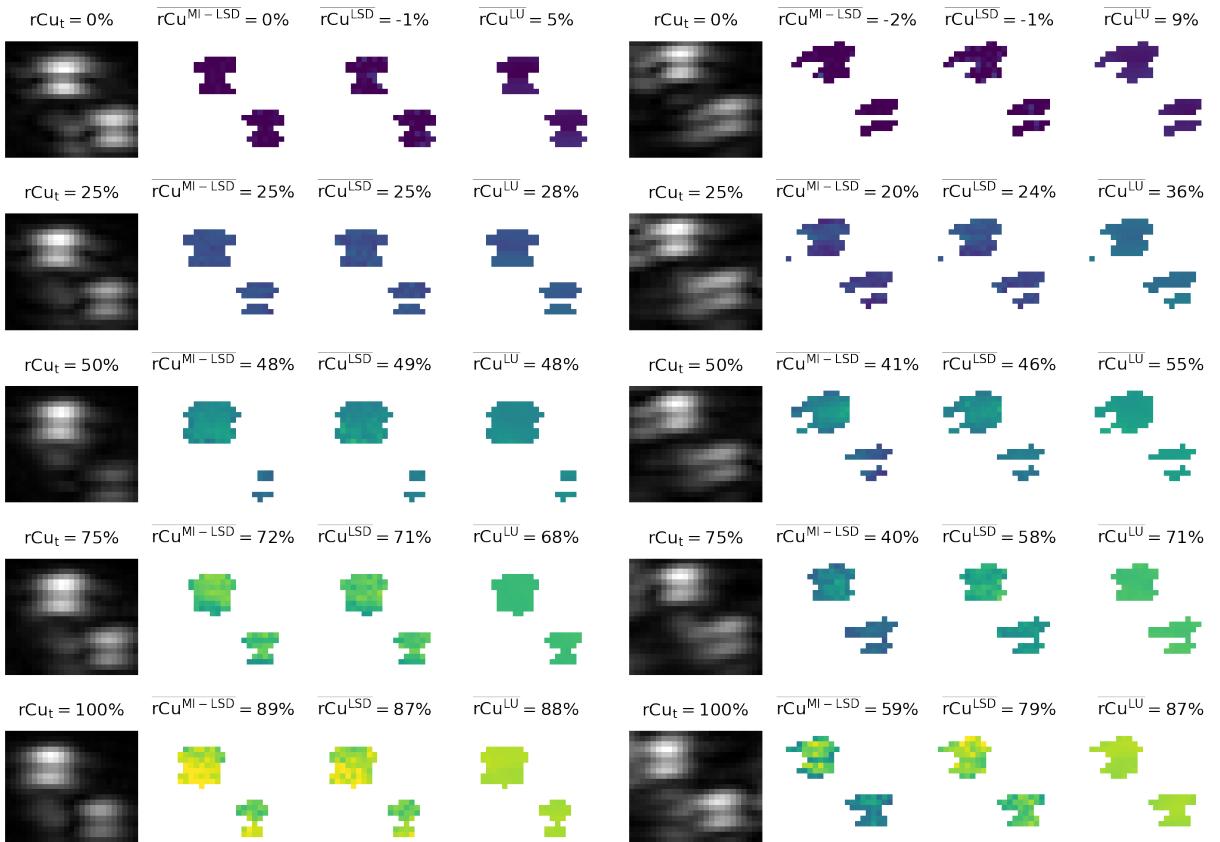


Figure 44:  $rCu_{bg} = 25\%$ ,  $svf = 0.5\%$ , NN with dropout – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

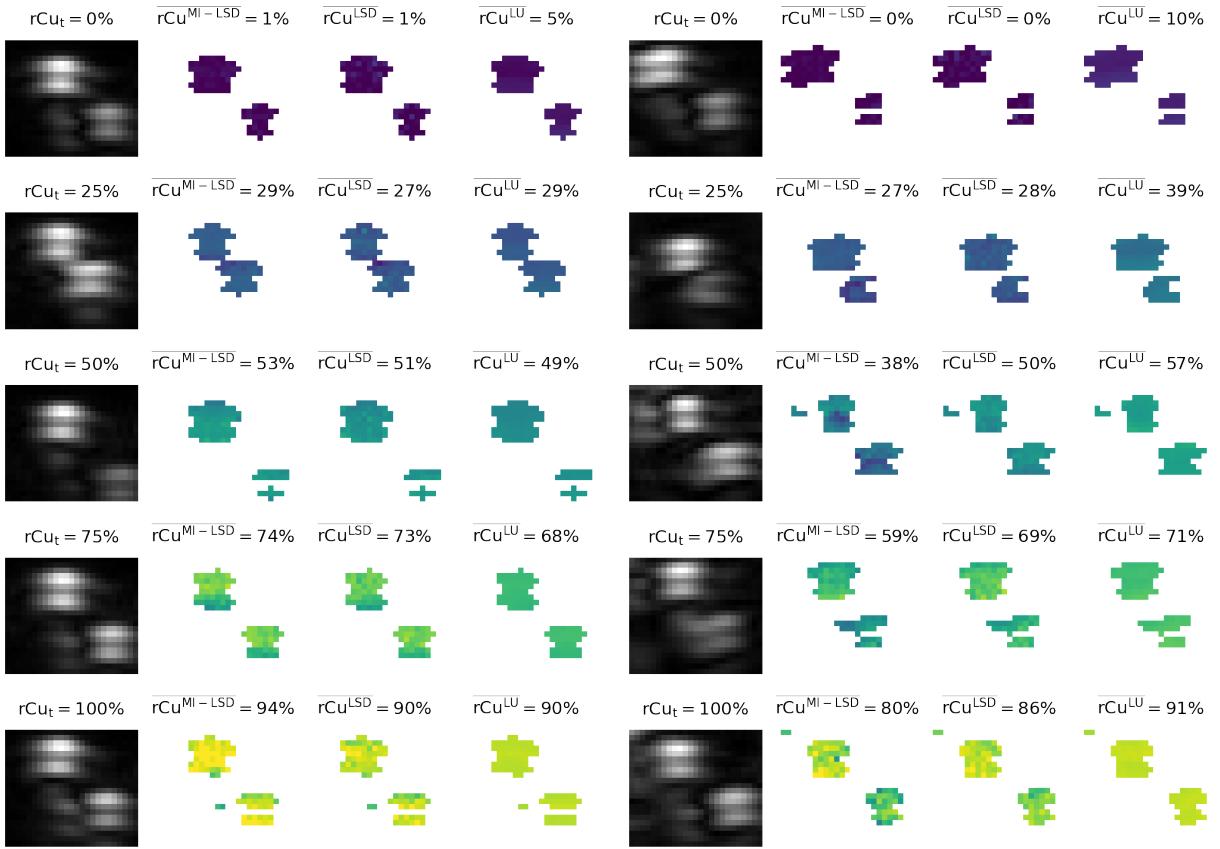


Figure 45:  $rCu_{bg} = 0\%$ ,  $svf = 0.5\%$ , NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

### 2.3.0.3 1.0% sulfate volume fraction (svf)

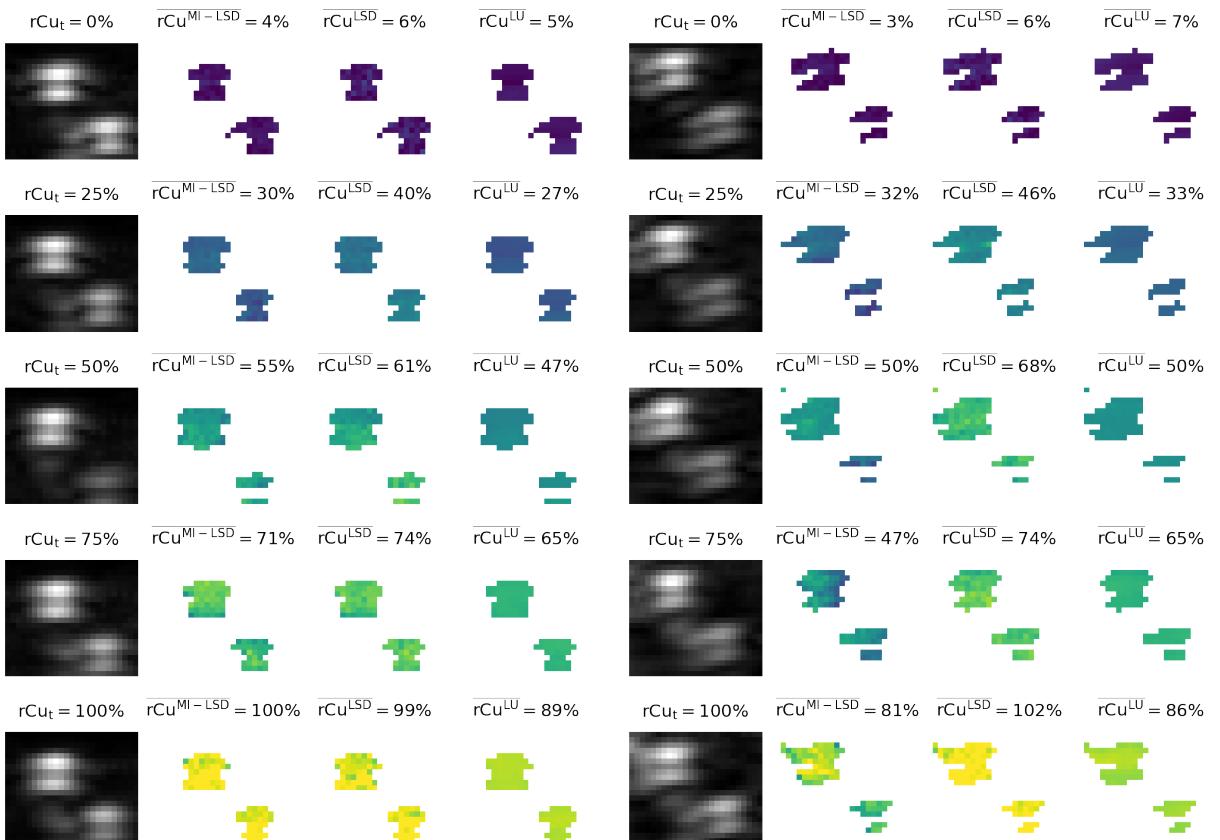


Figure 46:  $rCu_{bg} = 100\%$ ,  $svf = 1\%$ , NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

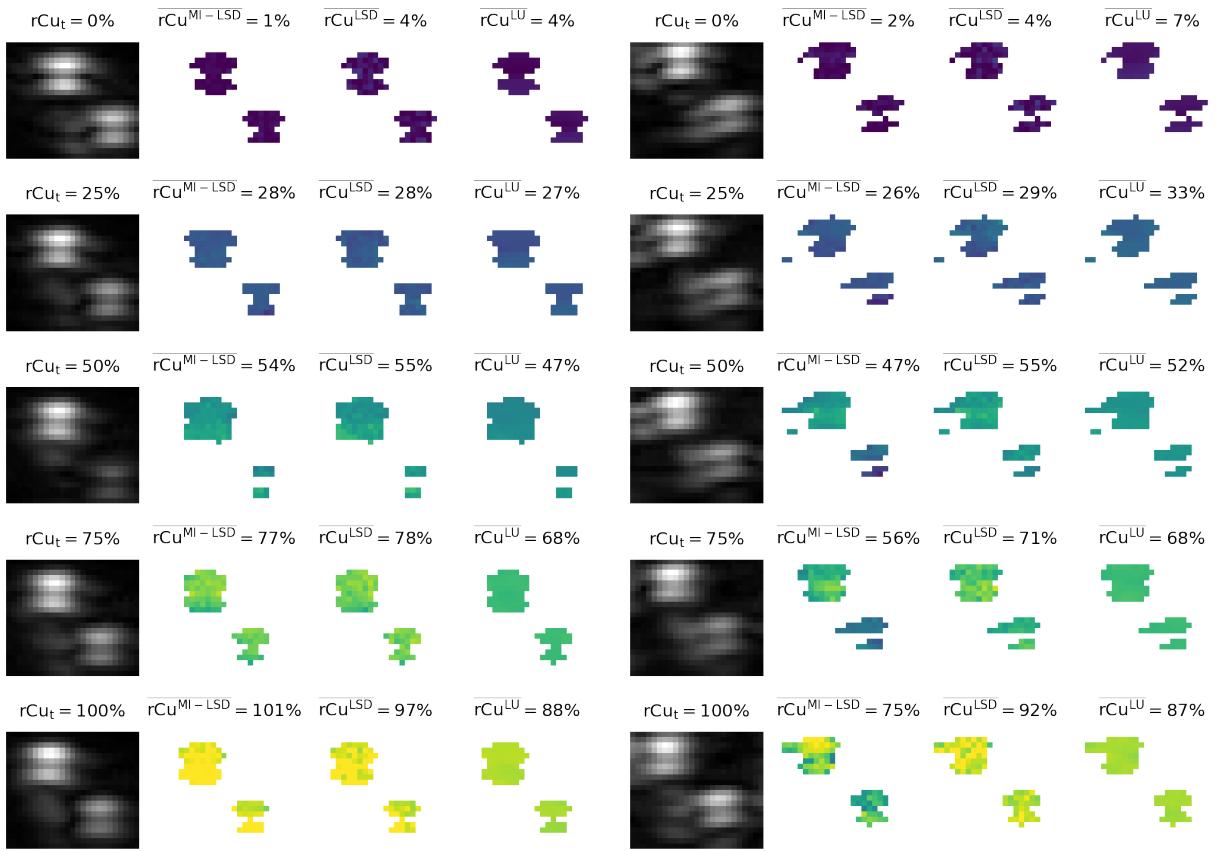


Figure 47:  $rCu_{bg} = 75\%$ , svf = 1%, NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

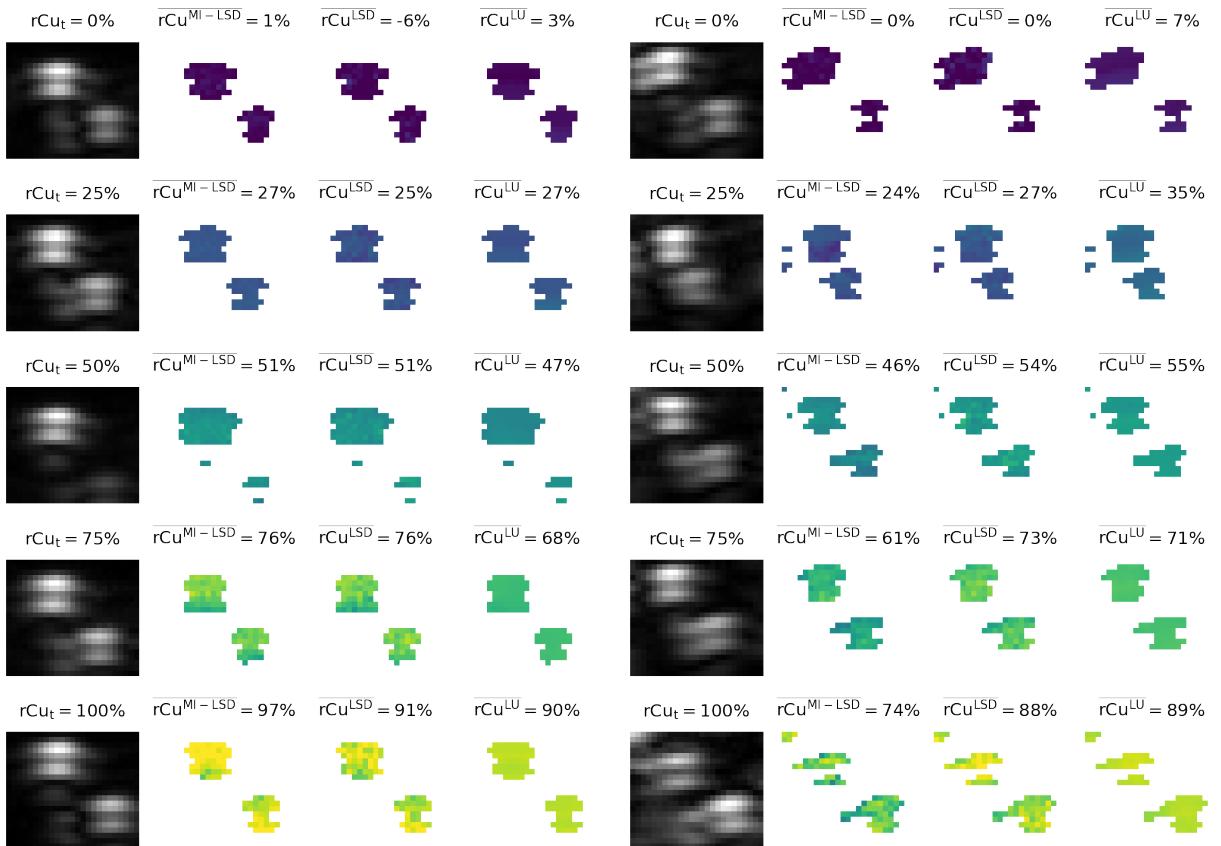


Figure 48:  $rCu_{bg} = 50\%$ , svf = 1%, NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

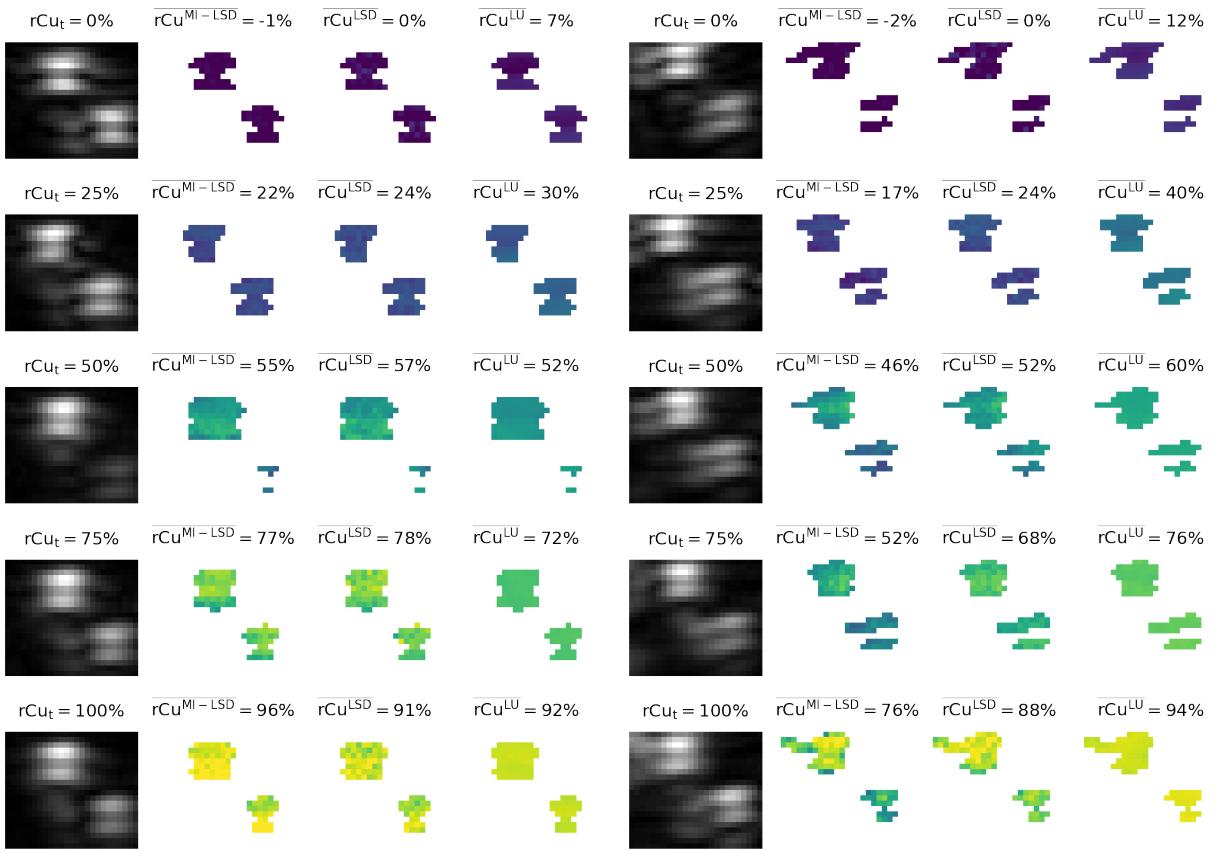


Figure 49:  $rCu_{bg} = 25\%$ ,  $svf = 1\%$ , NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

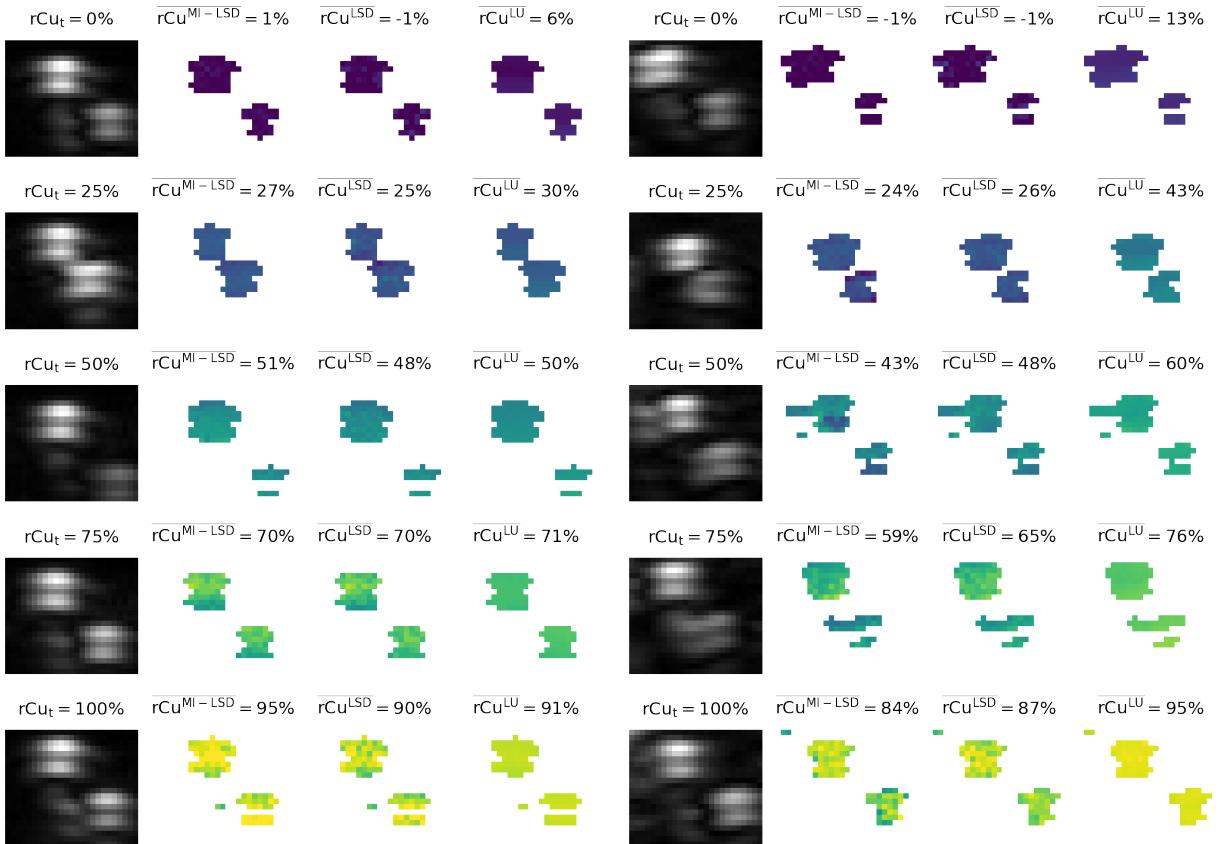


Figure 50:  $rCu_{bg} = 0\%$ ,  $svf = 1\%$ , NN with dropout – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

### 3 Phantom Test Set C

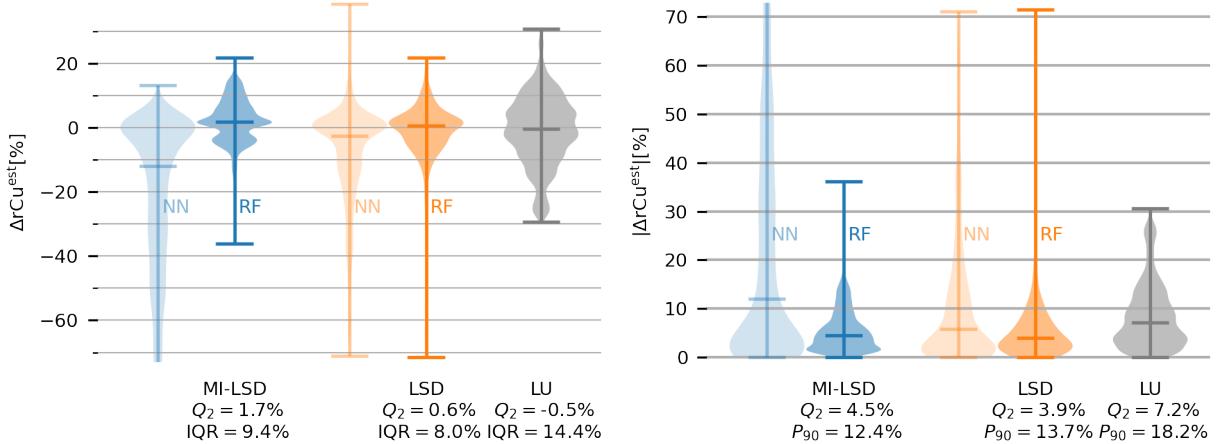


Figure 51: Estimation error distribution on the longitudinal phantom *test* set. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and gray is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

#### 3.1 Random Forest (RF)

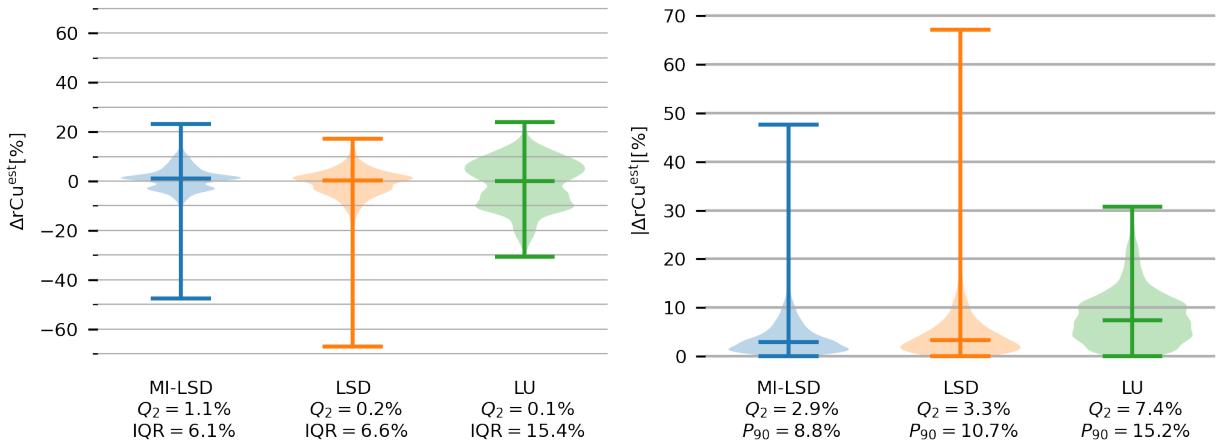


Figure 52: Random forest (RF) error distribution longitudinal phantom *test* set

### 3.1.0.1 Baseline – 0% sulfate volume fraction (svf)

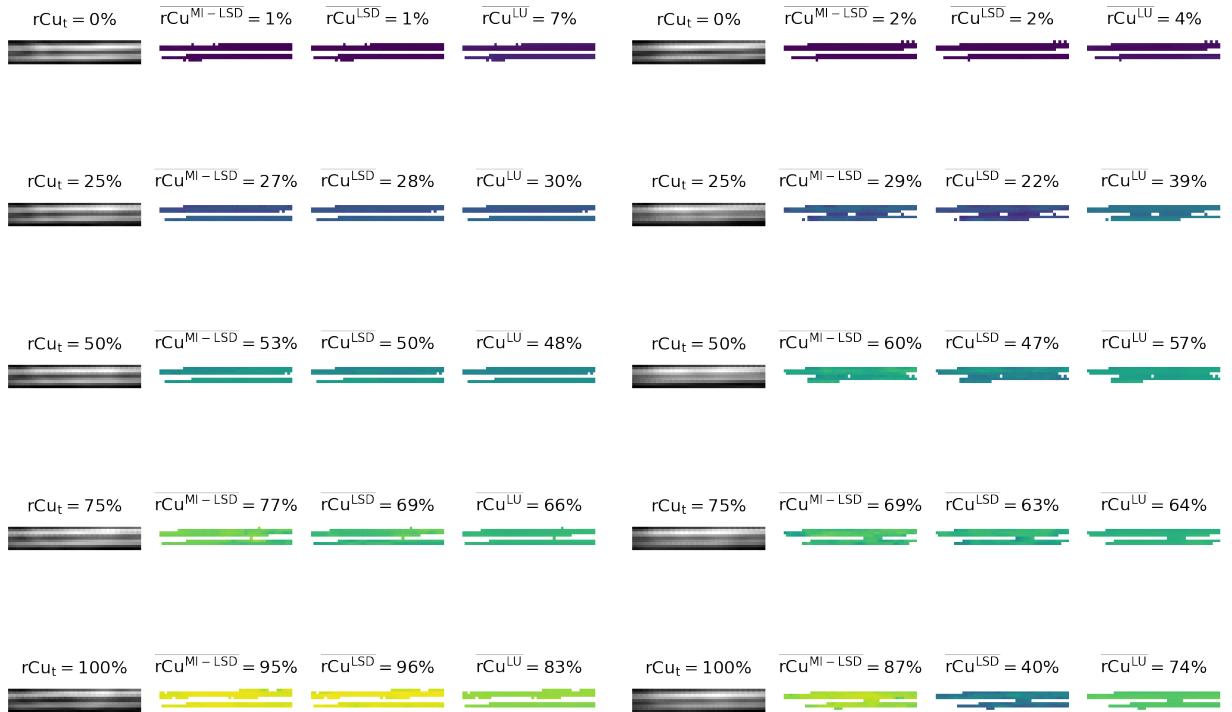


Figure 53: RF estimate on measurement 0, svf = 0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

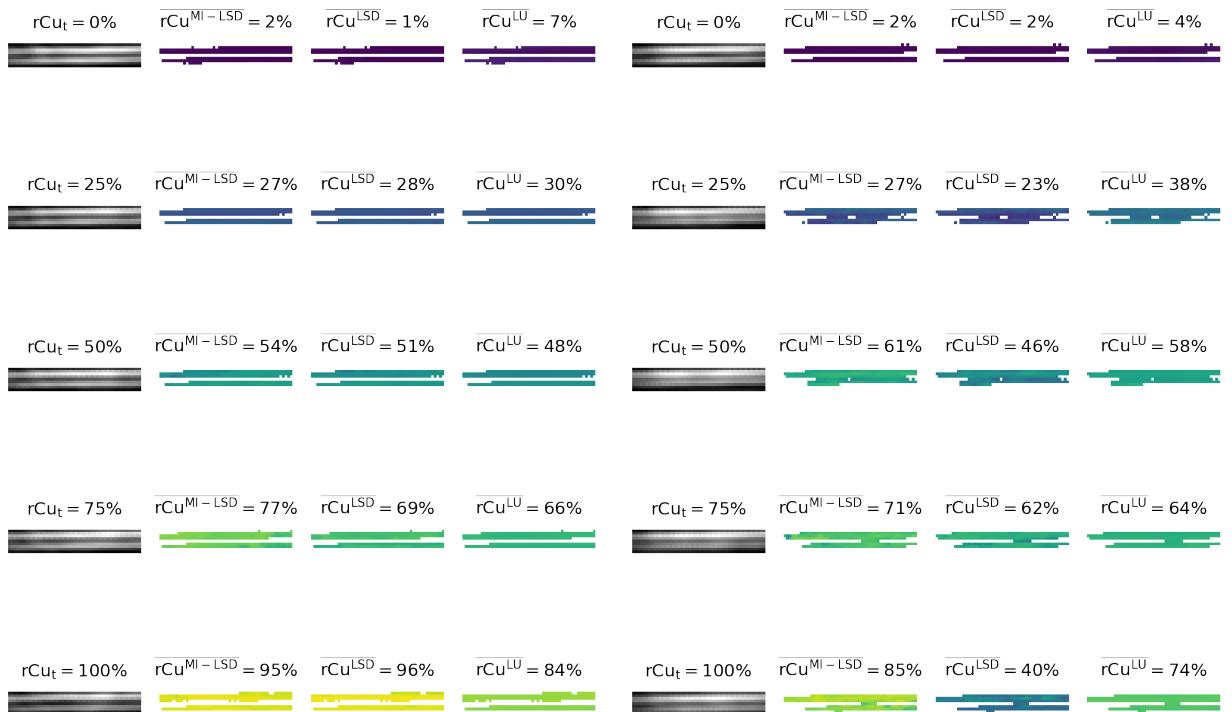


Figure 54: RF estimate on measurement 1, svf = 0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

### 3.1.0.2 1.0% sulfate volume fraction (svf)

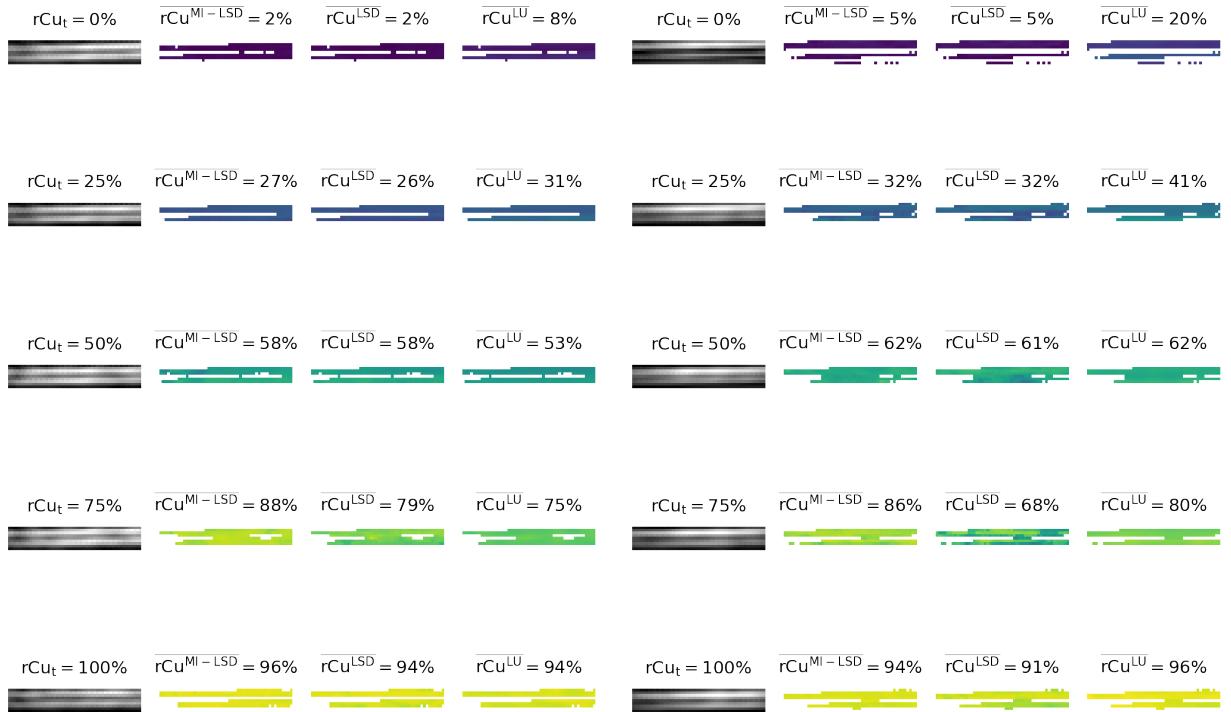


Figure 55: RF estimate on measurement 0, svf = 1.0%, background rCu=0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

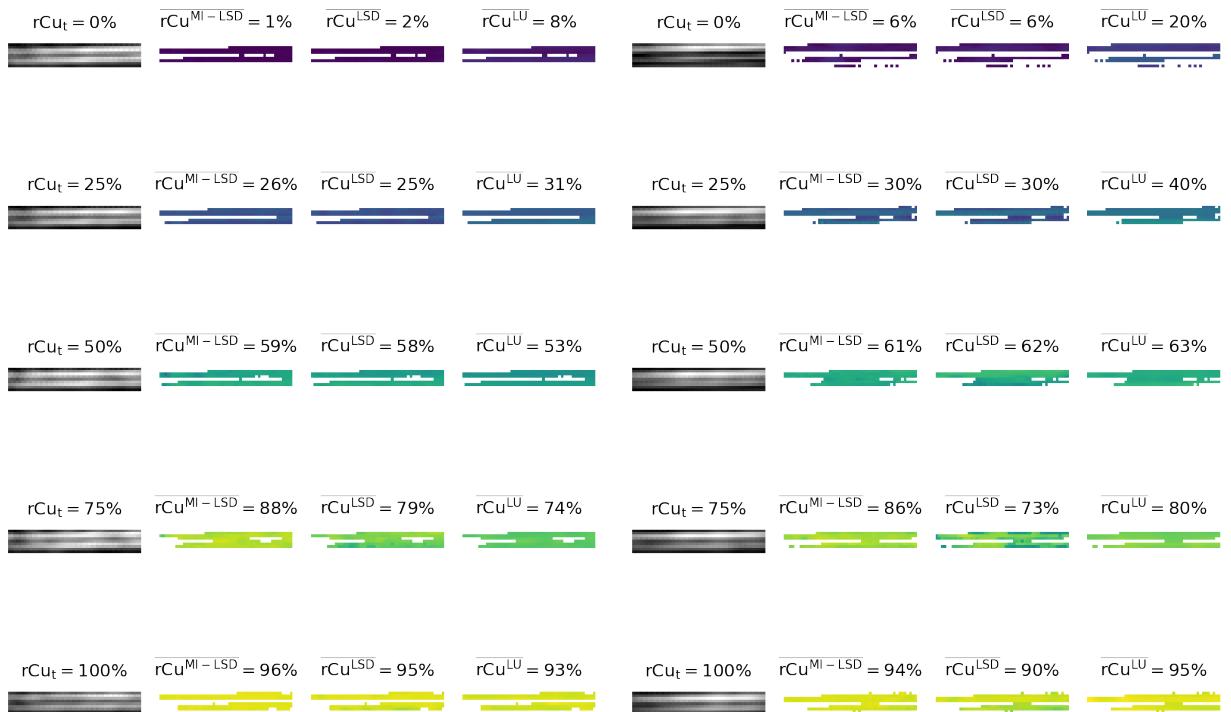


Figure 56: RF estimate on measurement 1, svf = 1.0%, background rCu=0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

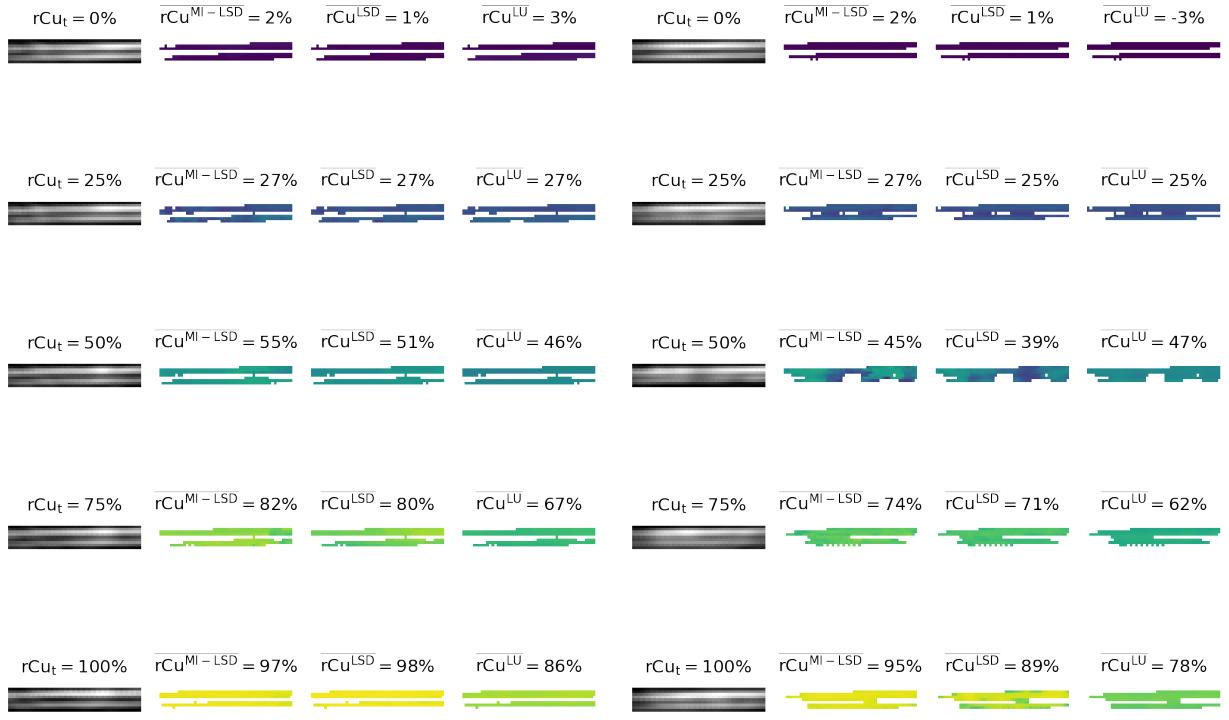


Figure 57: RF estimate on measurement 0, svf = 1.0%, background rCu=100% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

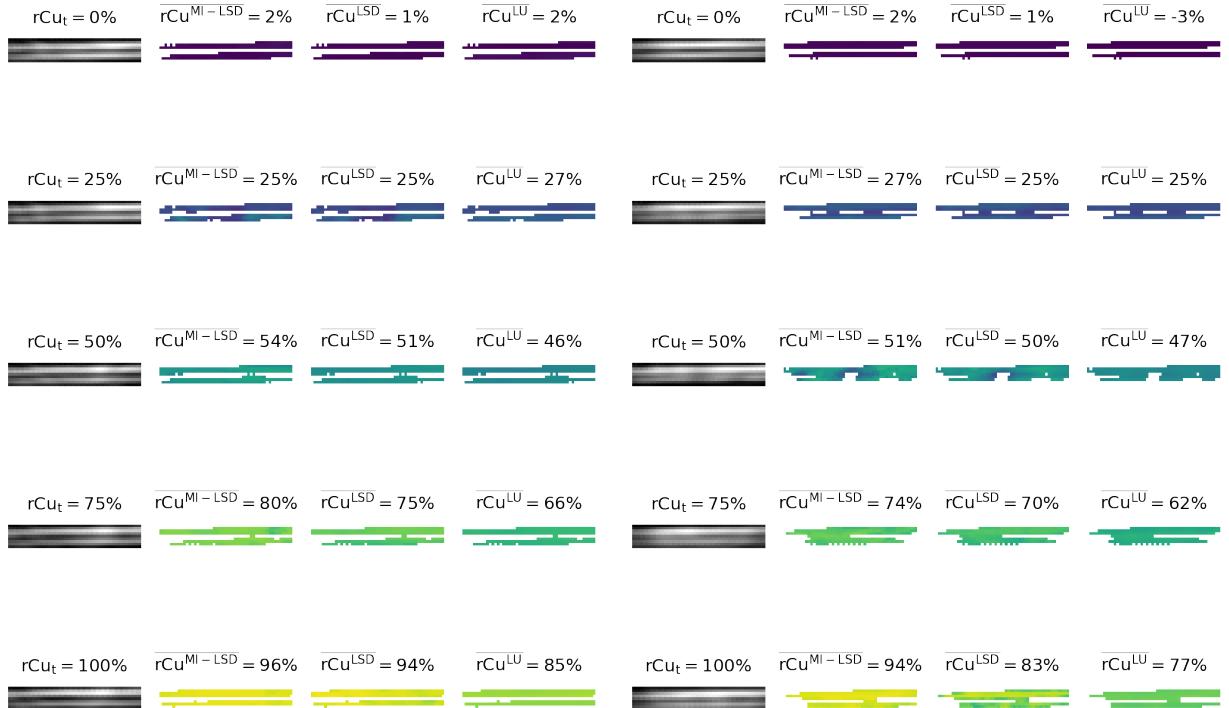


Figure 58: RF estimate on measurement 1, svf = 1.0%, background rCu=100% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

## 3.2 Feed Forward Neural Network (NN) – without dropout

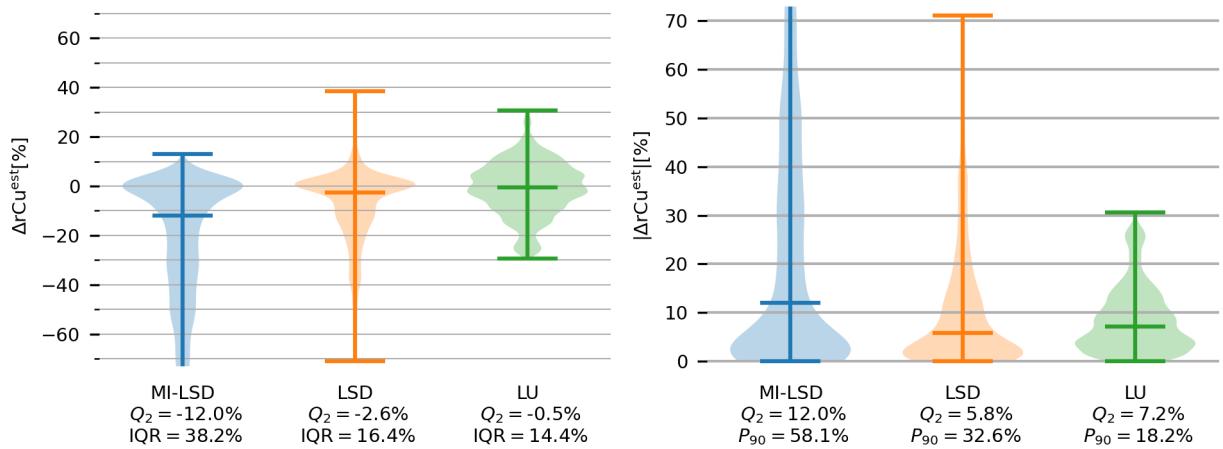


Figure 59: NN (no dropout) error distribution longitudinal phantom *test* set

### 3.2.0.1 Baseline – 0% sulfate volume fraction (svf)

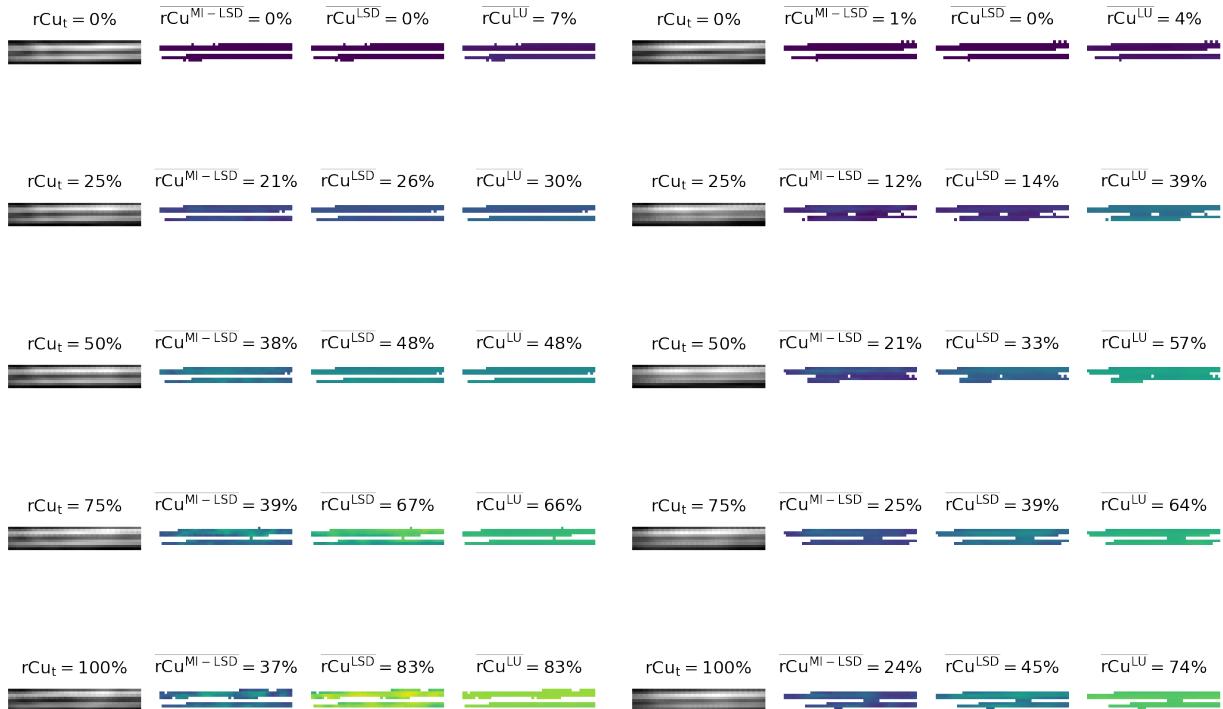


Figure 60: NN (no dropout) estimate on measurement 0, svf = 0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

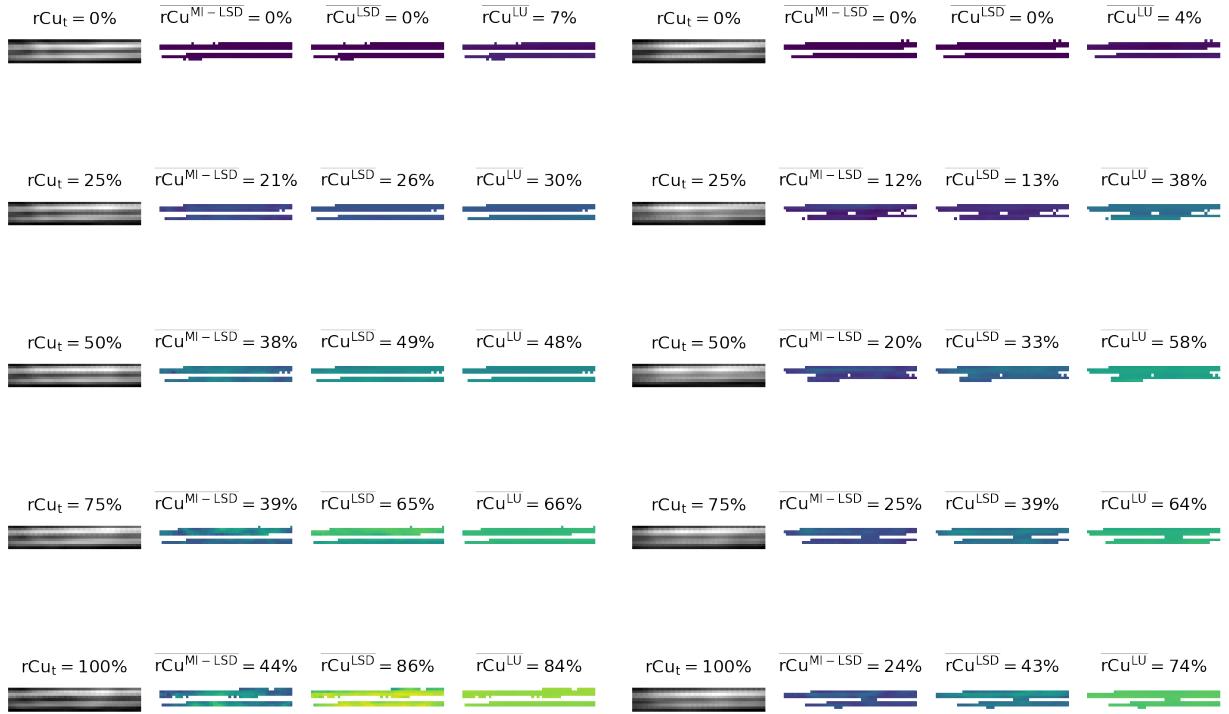


Figure 61: NN (no dropout) estimate on measurement 1, svf = 0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

### 3.2.0.2 1.0% sulfate volume fraction (svf)

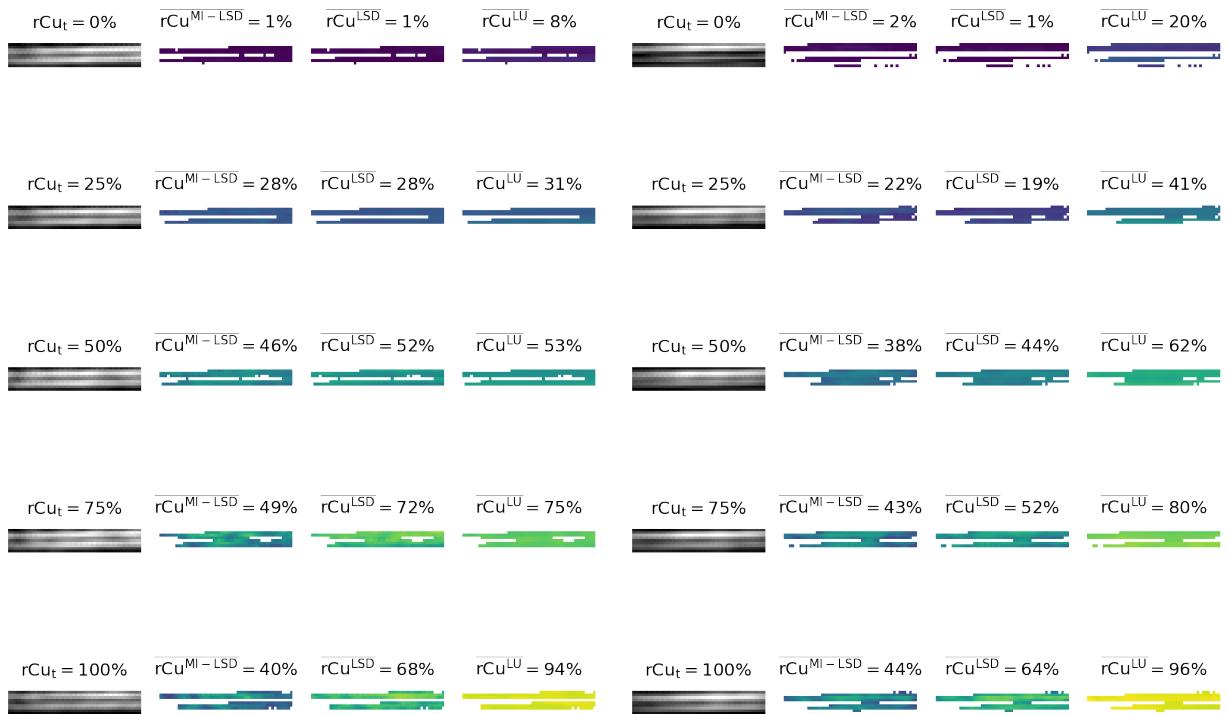


Figure 62: NN (no dropout) estimate on measurement 0, svf = 1.0%, background  $rCu=0\%$  – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

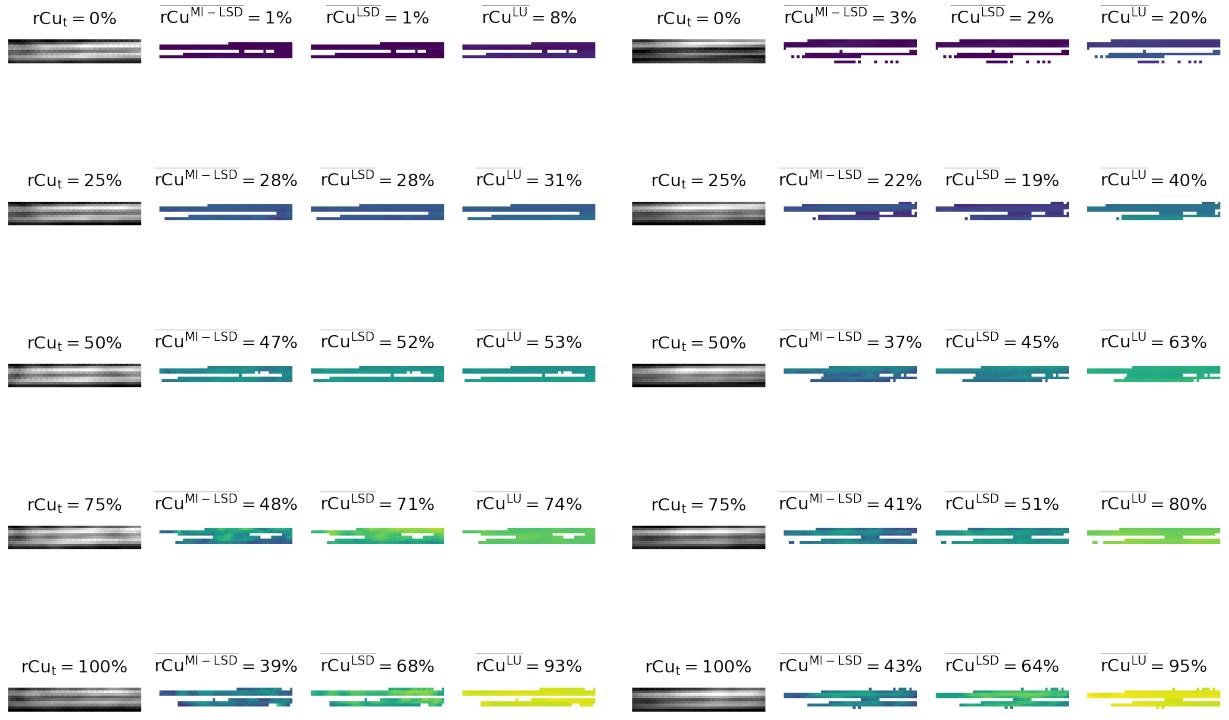


Figure 63: NN (no dropout) estimate on measurement 1, svf = 1.0%, background rCu=0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

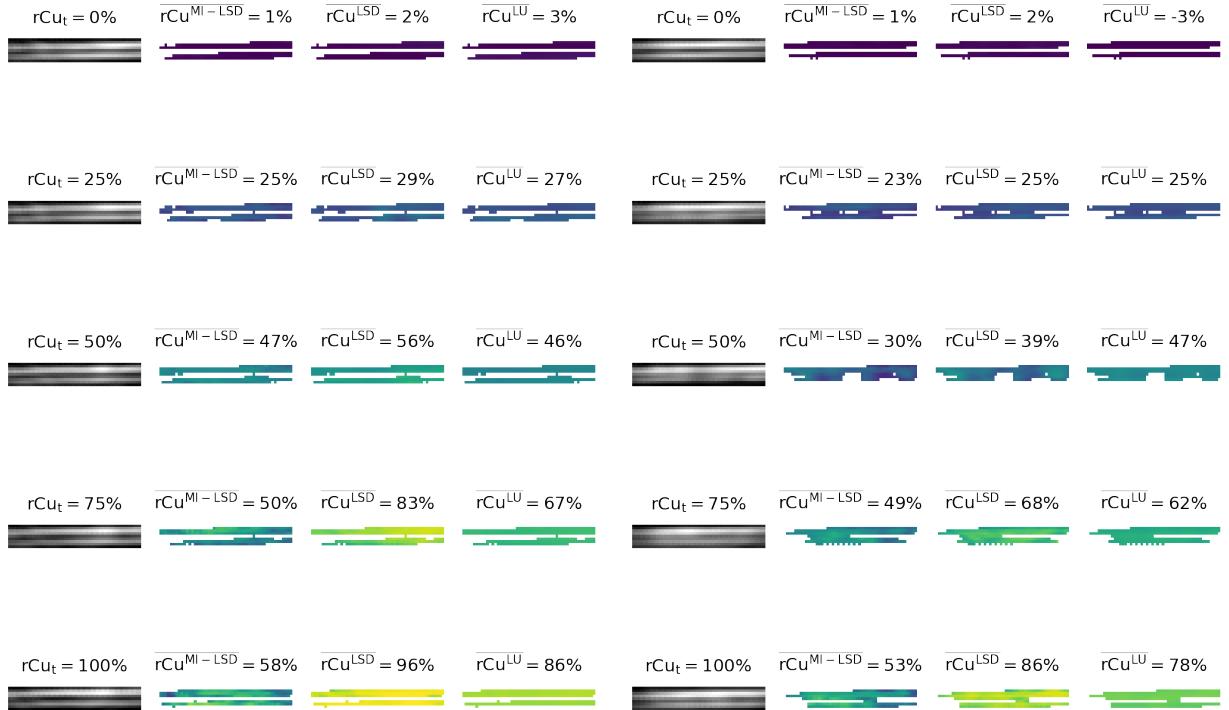


Figure 64: NN (no dropout) estimate on measurement 0, svf = 1.0%, background rCu=100% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

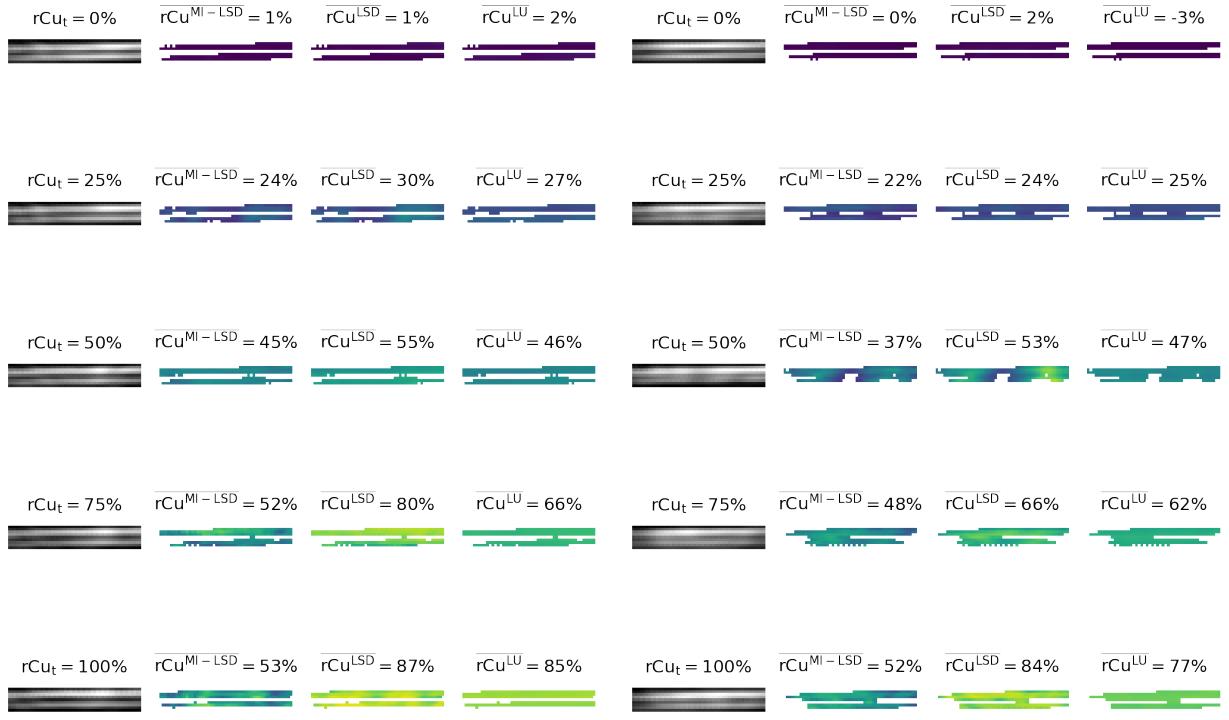


Figure 65: NN (no dropout) estimate on measurement 1, svf = 1.0%, background rCu=100% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

### 3.3 Feed Forward Neural Network (NN) – with dropout

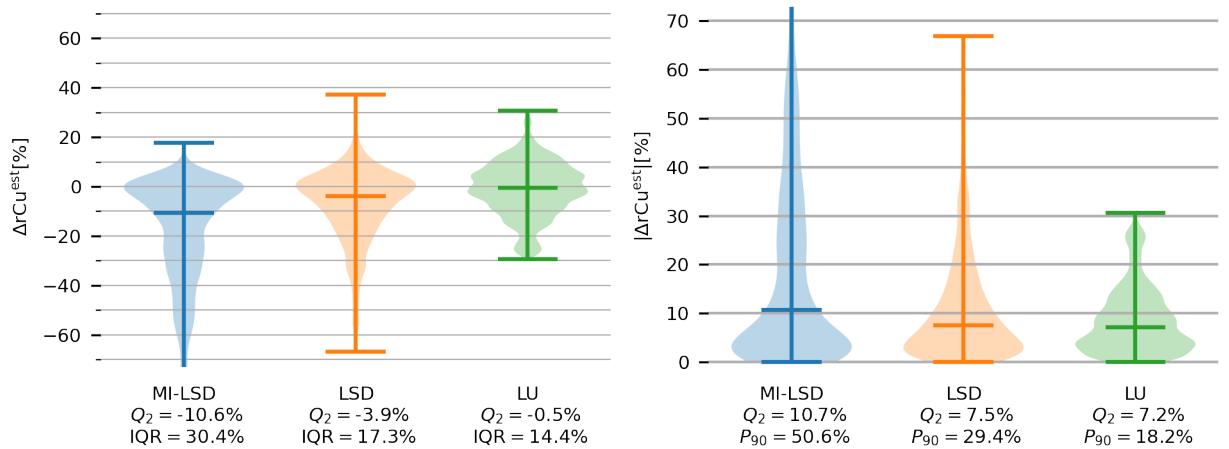


Figure 66: NN (with dropout) error distribution longitudinal phantom *test* set

### 3.3.0.1 Baseline – 0% sulfate volume fraction (svf)

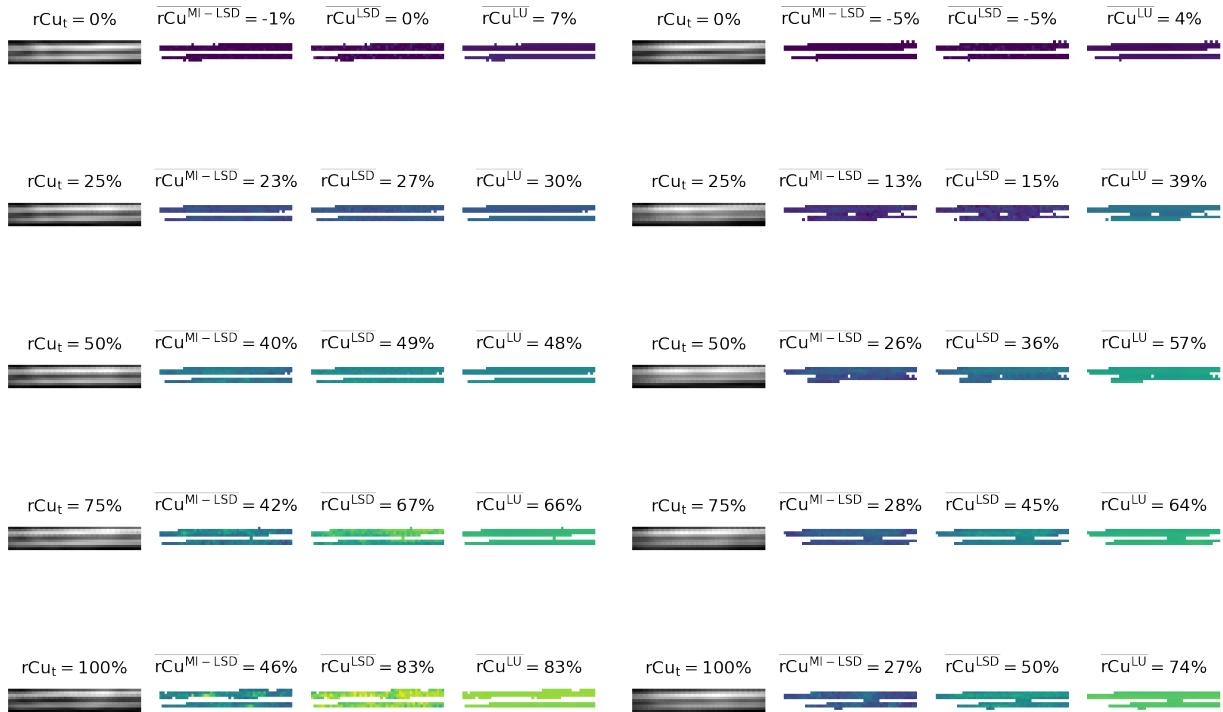


Figure 67: NN (with dropout) estimate on measurement 0, svf = 0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

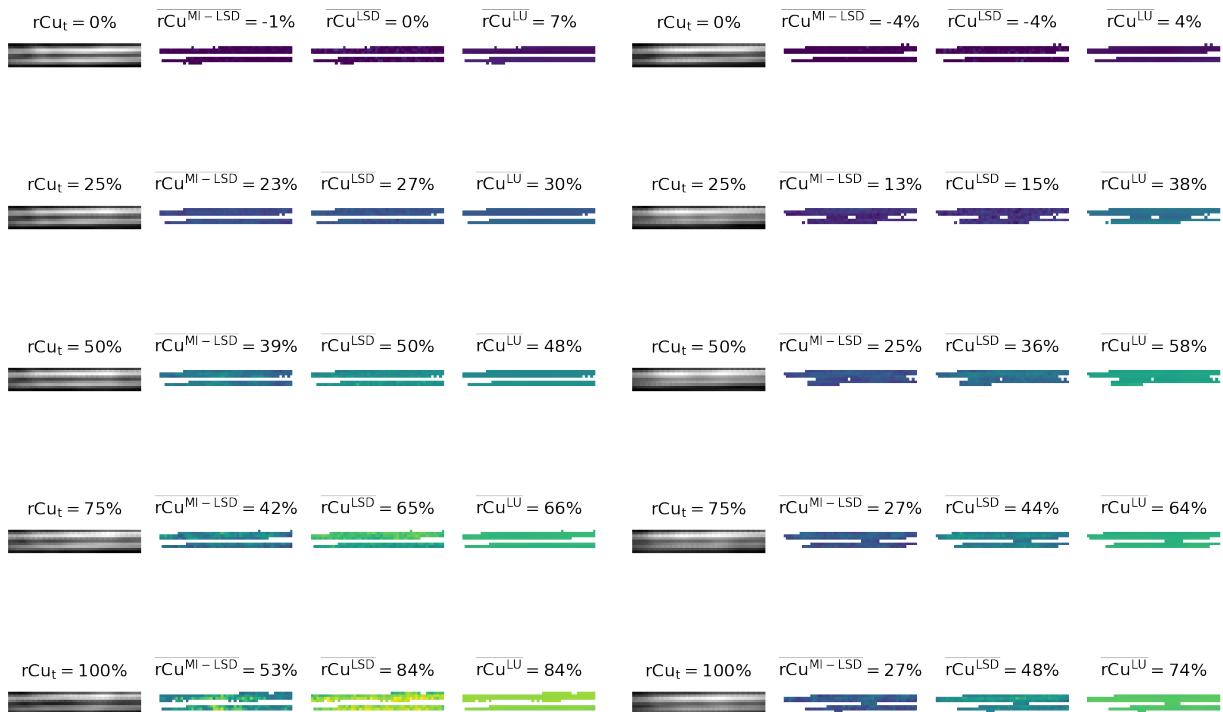


Figure 68: NN (with dropout) estimate on measurement 1, svf = 0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

### 3.3.0.2 1.0% sulfate volume fraction (svf)

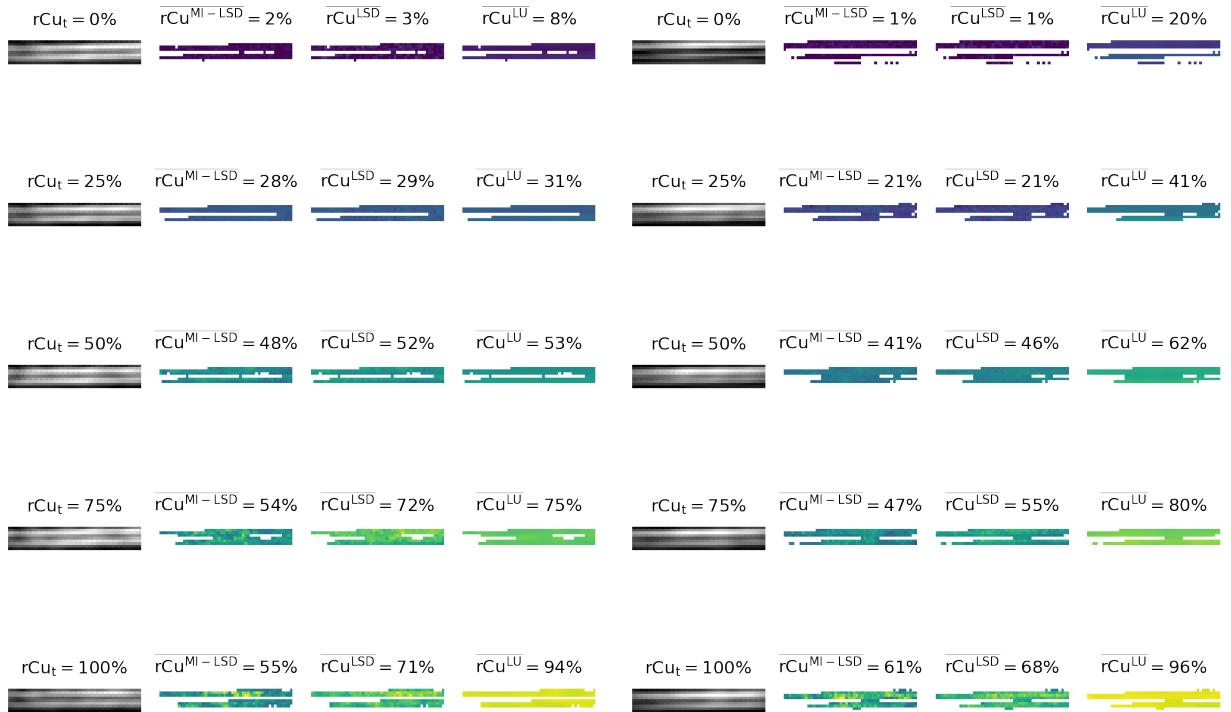


Figure 69: NN (with dropout) estimate on measurement 0, svf = 1.0%, background rCu=0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

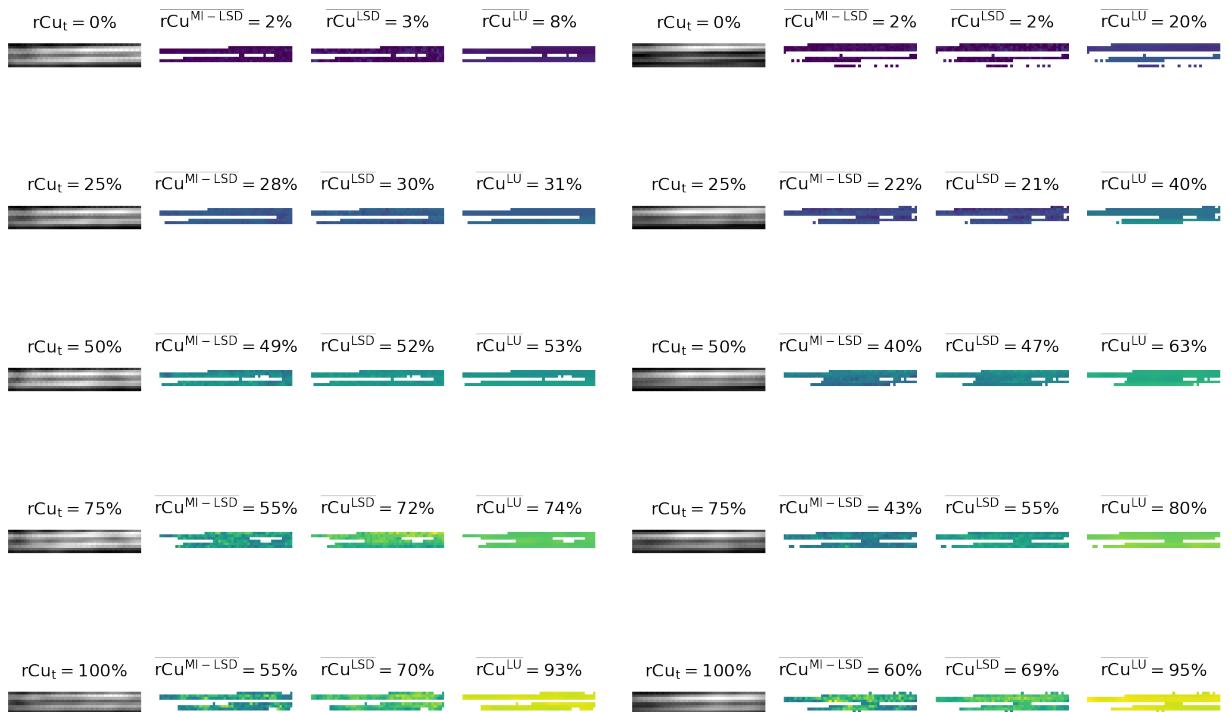


Figure 70: NN (with dropout) estimate on measurement 1, svf = 1.0%, background rCu=0% – mean rCu estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

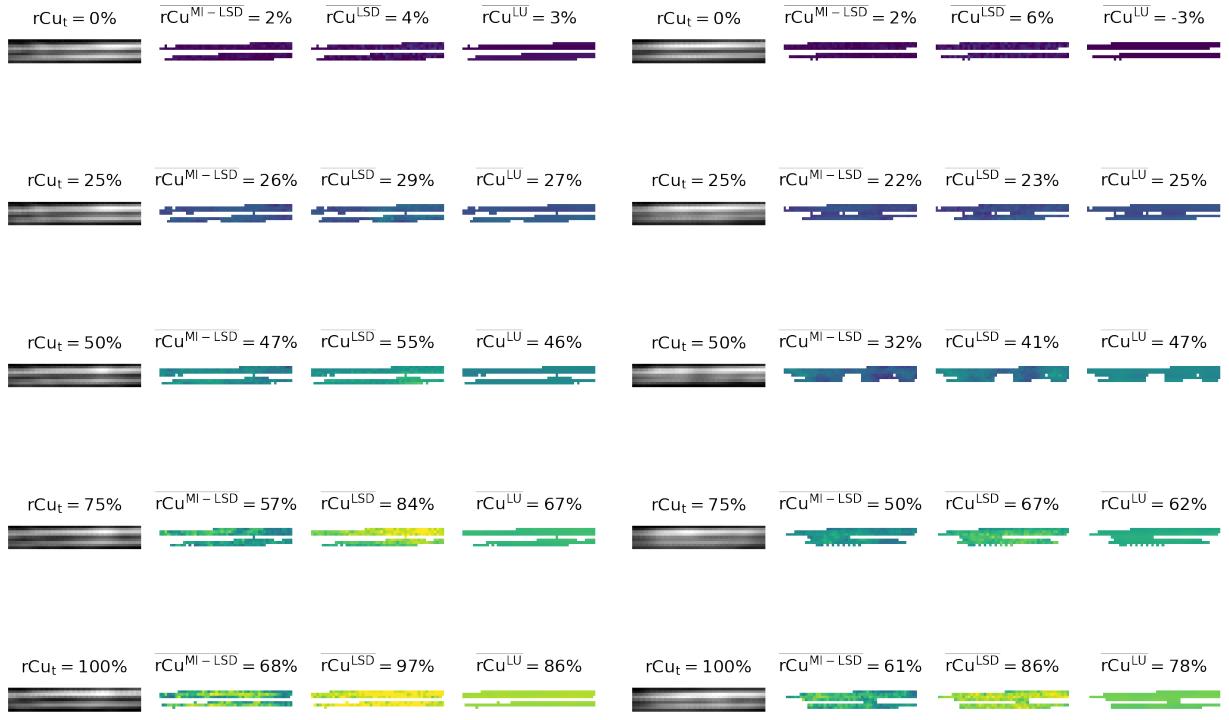


Figure 71: NN (with dropout) estimate on measurement 0, svf = 1.0%, background  $rCu=100\%$  – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates

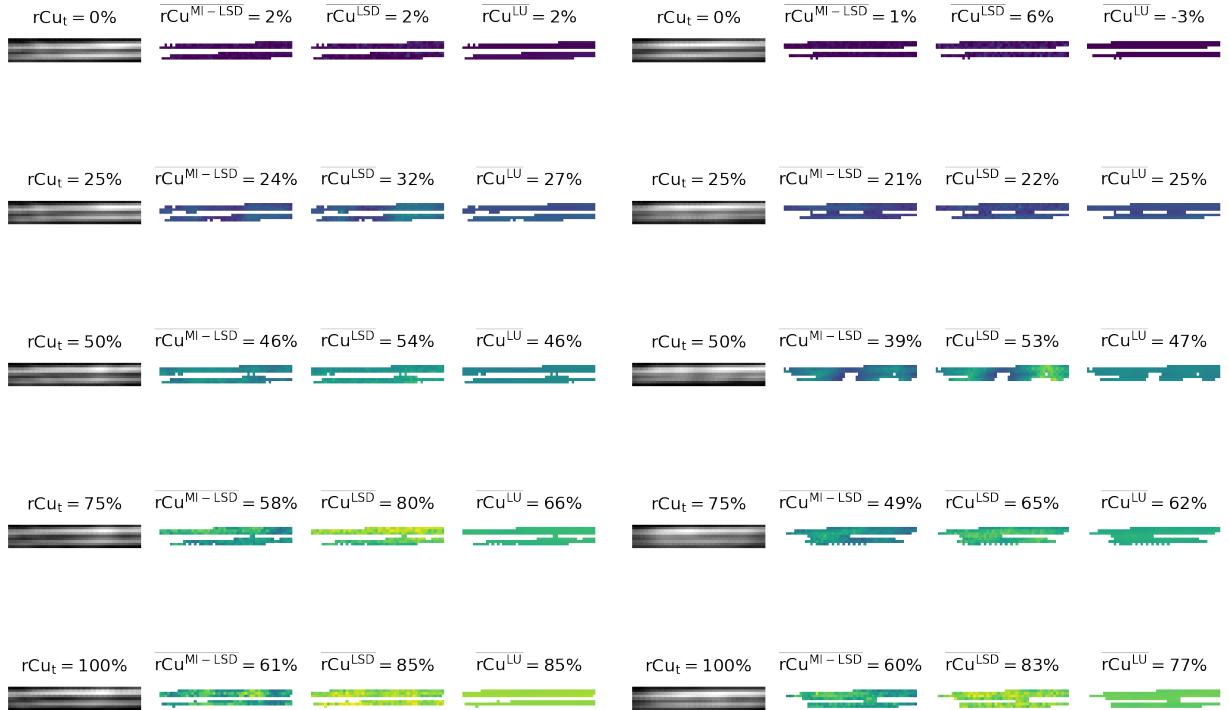


Figure 72: NN (with dropout) estimate on measurement 1, svf = 1.0%, background  $rCu=100\%$  – mean  $rCu$  estimates for Left: upper, Right: lower tubes. Showing mean signal and MI-LSD, LSD and LU estimates.

## 4 Phantom Validation Set (A)

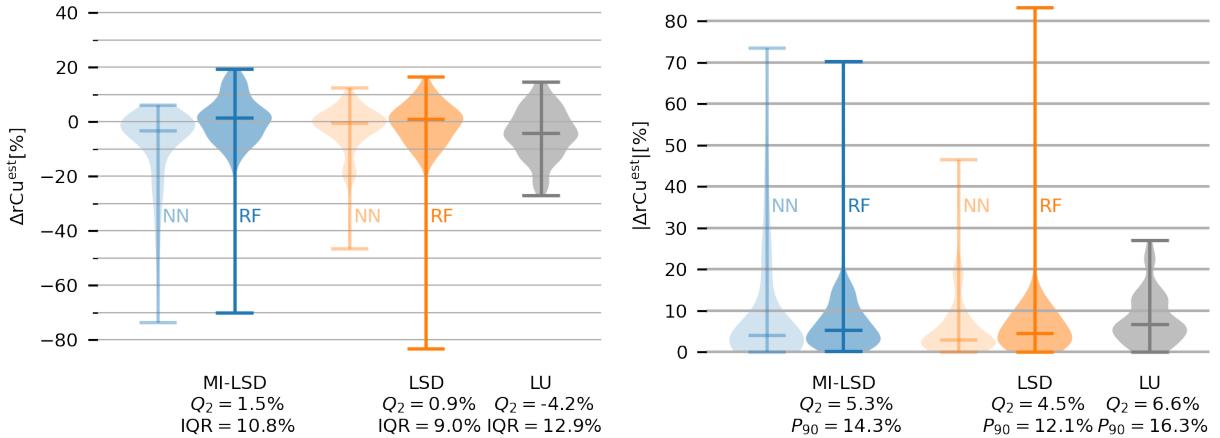


Figure 73: Estimation error distribution on the initial phantom *validation* set. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and gray is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

### 4.1 Random Forest (RF)

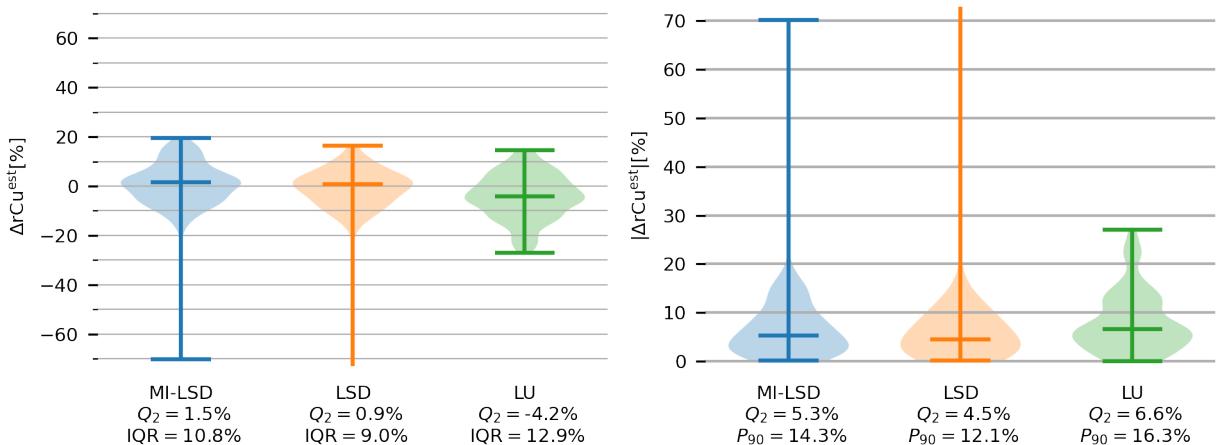


Figure 74: Estimation error distribution on the *validation* phantom, RF. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and grey is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .



Figure 75: RF estimates on validation phantom with svf= 1.0%, background rCu=[100, 75, 50, 25]% – mean rCu estimates for tubes. Showing PA mean signal and MI-LSD, LSD and LU estimates.

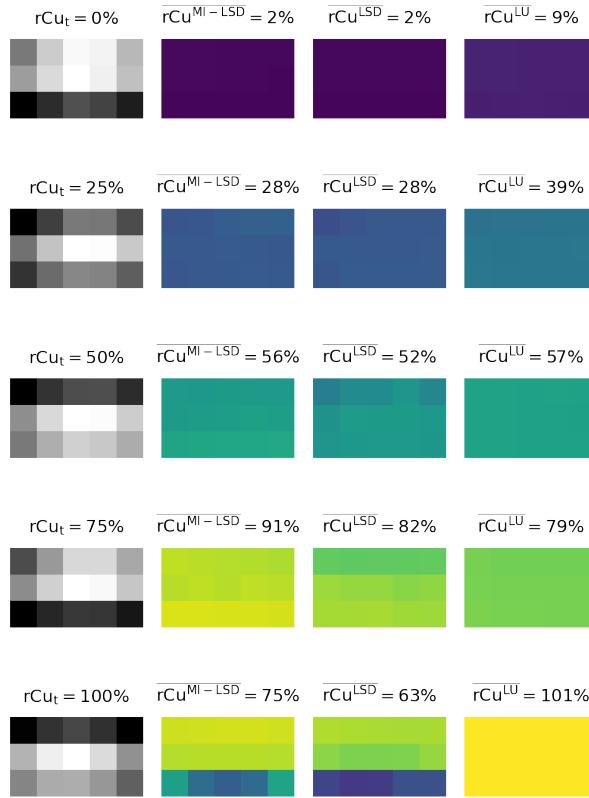


Figure 76: RF estimates on validation phantom with svf= 1.0%, background rCu=0% – mean rCu estimates for tubes. Showing PA mean signal and MI-LSD, LSD and LU estimates.

## 4.2 Feed Forward Neural Network (NN) – without dropout

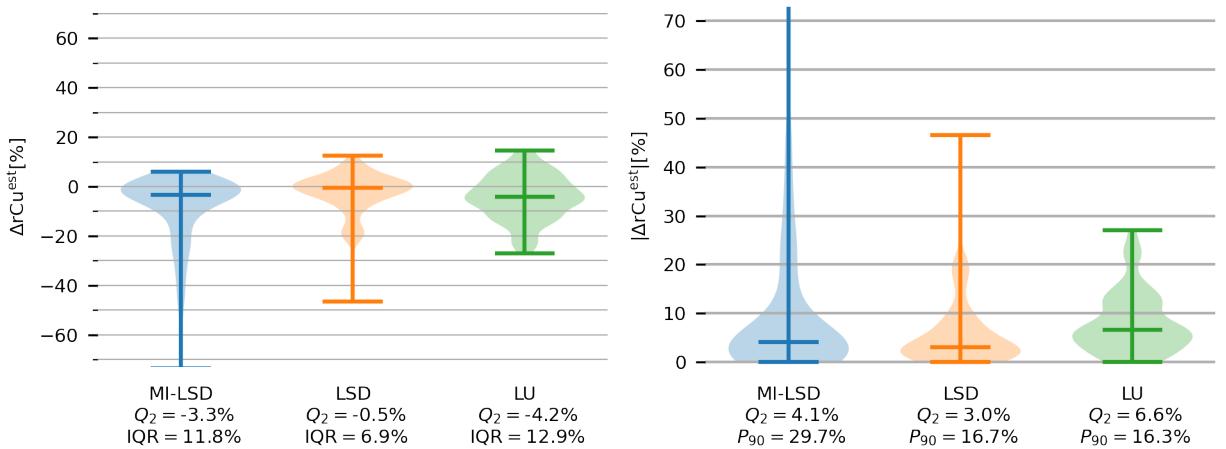


Figure 77: Estimation error distribution on the *validation* phantom, NN no dropout. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and grey is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

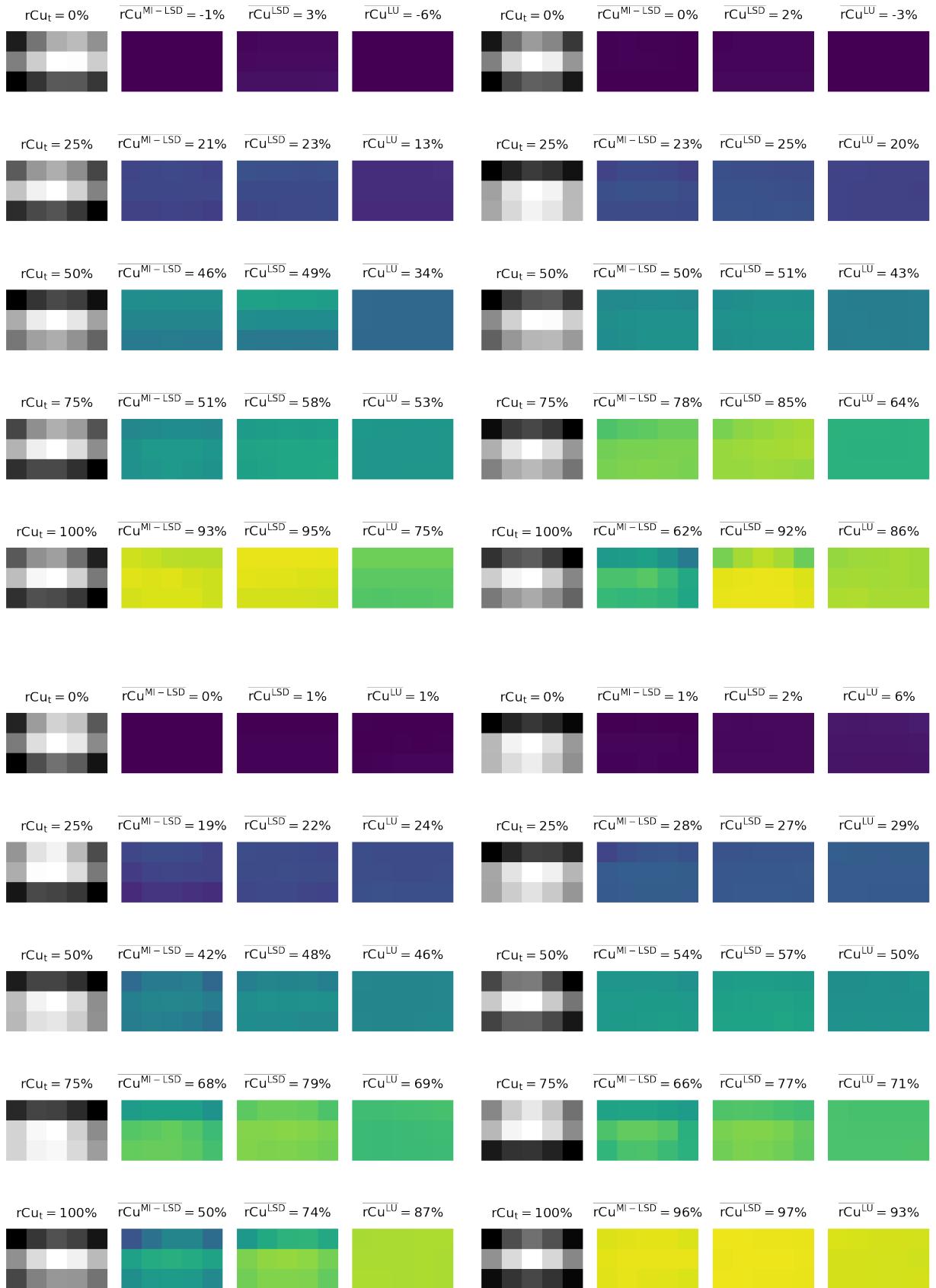


Figure 78: NN (no dropout) estimates on validation phantom with svf= 1.0%, background rCu=[100, 75, 50, 25]% – mean rCu estimates for tubes. Showing PA mean signal and MI-LSD, LSD and LU estimates.

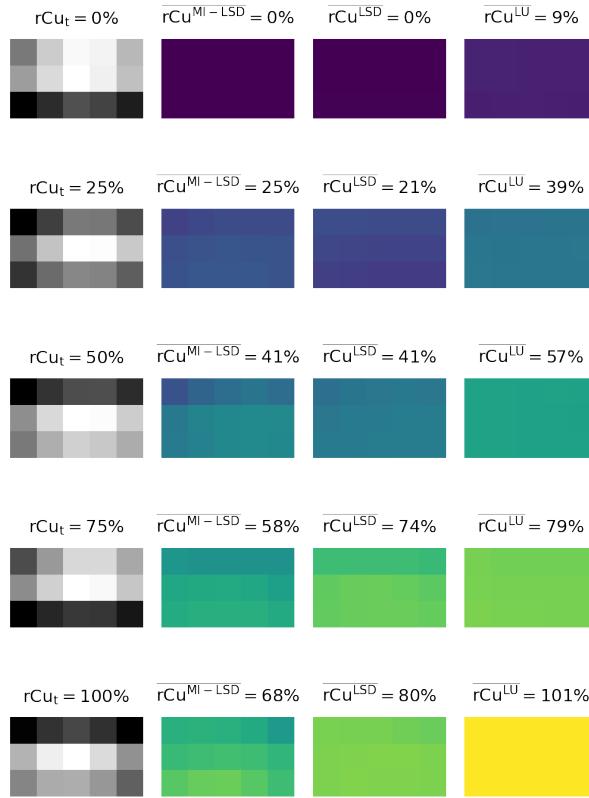


Figure 79: NN (no dropout) estimates on validation phantom with svf= 1.0%, background rCu=0% – mean rCu estimates for tubes. Showing PA mean signal and MI-LSD, LSD and LU estimates.

#### 4.3 Feed Forward Neural Network (NN) – with dropout

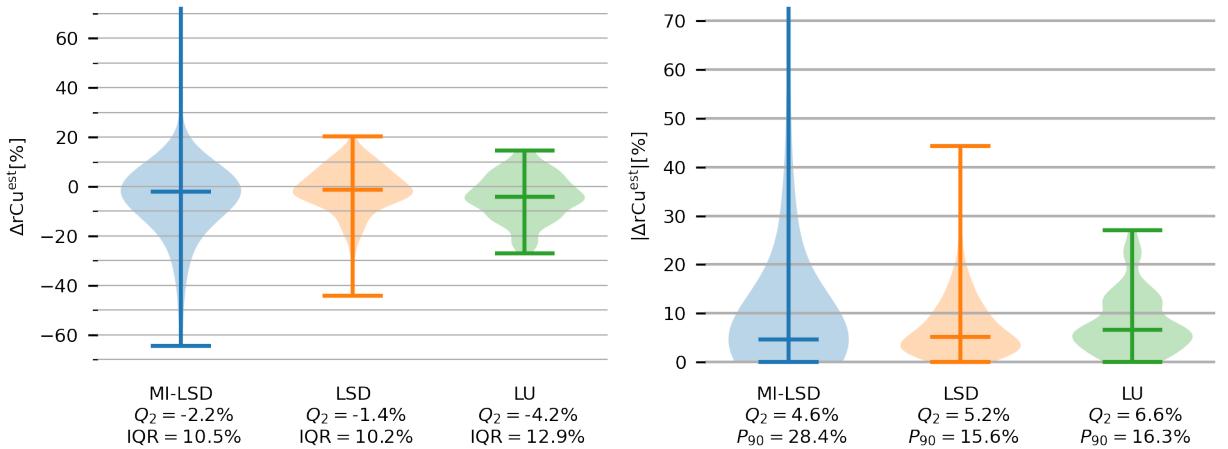


Figure 80: Estimation error distribution on the *validation* phantom, NN with dropout. rCu estimation errors ( $\Delta rCu^{est}$ ) are shown left, their absolutes right. Blue shows the rCu estimators trained with multiple illumination learned spectral decoloring (MI-LSD), orange the estimators trained with learned spectral decoloring (LSD) and grey is the linear spectral unmixing (LU) reference. Listed: Medians  $Q_2$ , interquartile ranges (IQR) and 90 percentiles  $P_{90}$ .

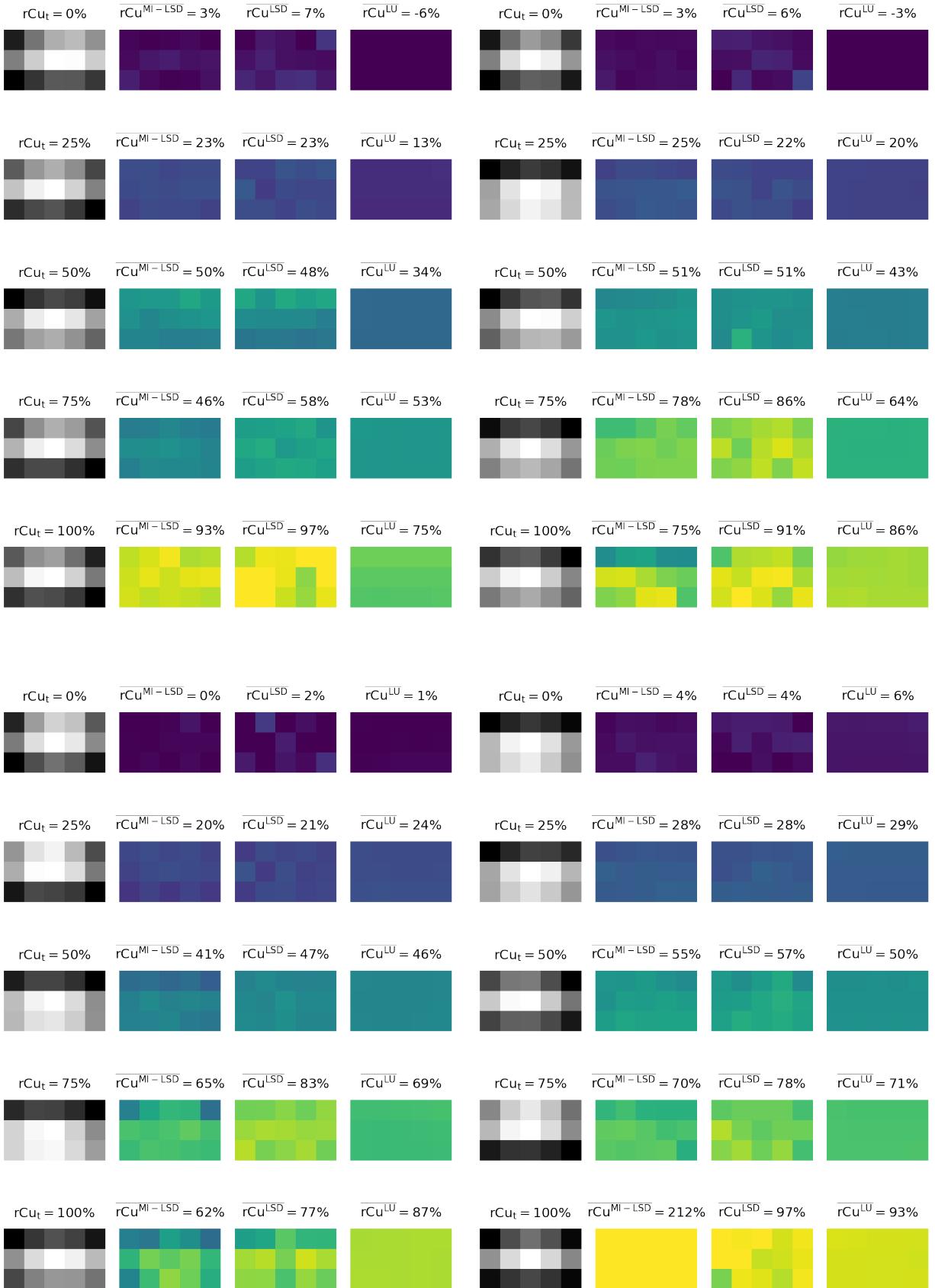


Figure 81: NN (with dropout) estimates on validation phantom with svf= 1.0%, background rCu=[100, 75, 50, 25]% – mean rCu estimates for tubes. Showing PA mean signal and MI-LSD, LSD and LU estimates.

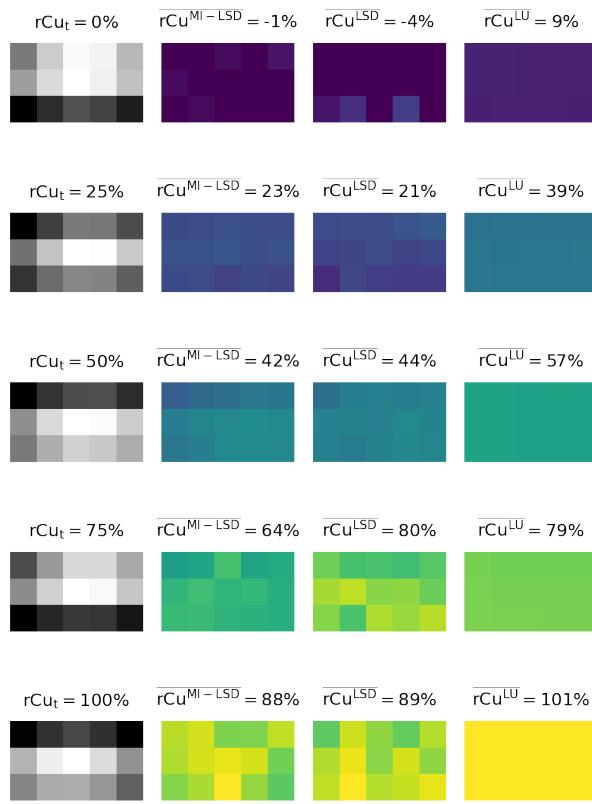


Figure 82: NN (with dropout) estimates on validation phantom with svf= 1.0%, background  $rCu=0\%$  – mean  $rCu$  estimates for tubes. Showing PA mean signal and MI-LSD, LSD and LU estimates.