Calculating the Shift of Tails - SOT

ENS members giving forecast values well beyond the M-climate extreme contribute no more to the EFI than members just matching the M-climate extreme. The Shift of Tails (SOT) is an additional product that has been developed to address this "limitation". The SOT index complements the EFI by providing information about how extreme an event could potentially be. Specifically, it compares the tails of the ENS and M-climate distributions.

SOT compares the tails of both distributions of M-climate and ENS based on the 90th and 99th (upper tail) percentiles. In addition, for just 2m temperature, a lower tail (cold temperature) SOT value is computed, using 1st and 10th percentiles. In each case positive SOT values indicate that at least 10% of the ensemble is forecasting an "extreme event". A high value of SOT shows just how extreme the 10% ENS outlier results are.

EFI and SOT are computed for many weather parameters, and for different forecast ranges and accumulation periods. Charts may be accessed via the ECMWF web pages.

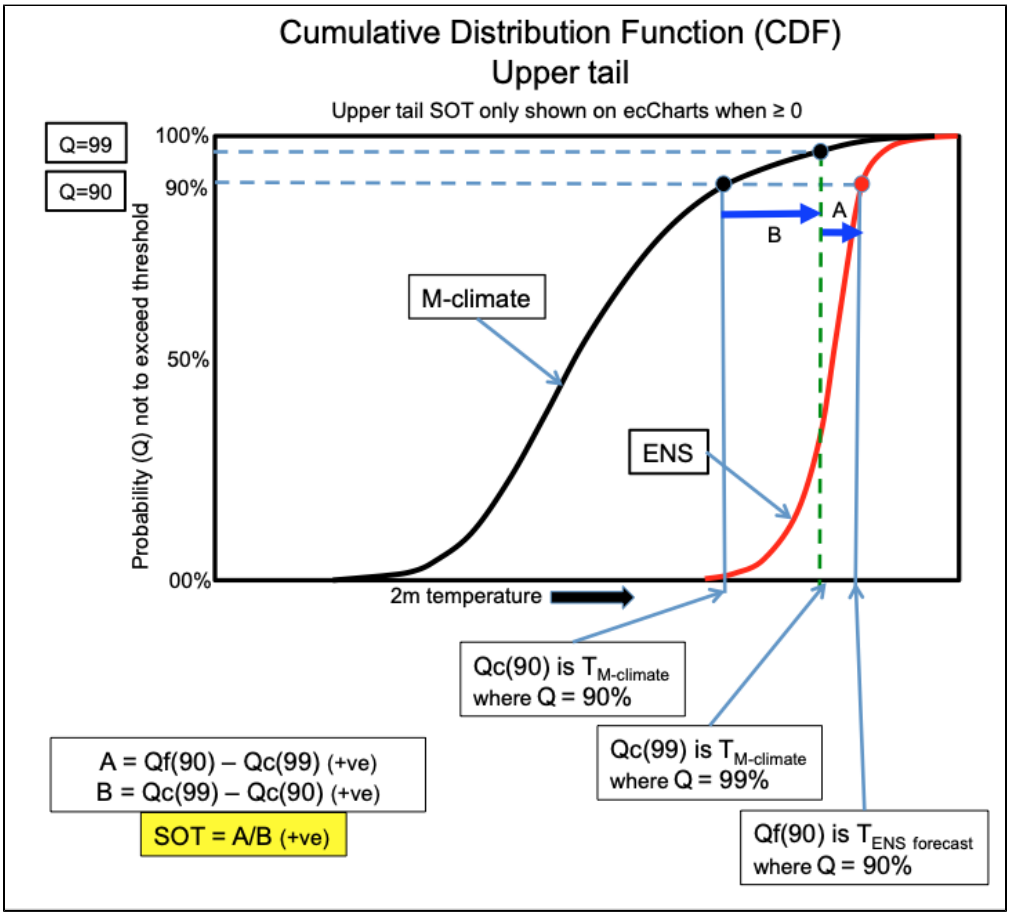

Fig8.1.4.9A: *Example corresponds to a large positive EFI (red ENS forecast curve well to the right of the black M-Climate curve). The positive upper tail SOT (quantile 90) indicates several ENS members are predicting extreme warm temperatures (above the 99th M-climate percentile shown by the dashed green line). This suggests unusually warm temperatures may be confidently forecast (large positive EFI), but very extreme is only a minimal risk (because SOT is only +0.4). The higher the SOT is the more extreme is the warm end of the ENS range.*

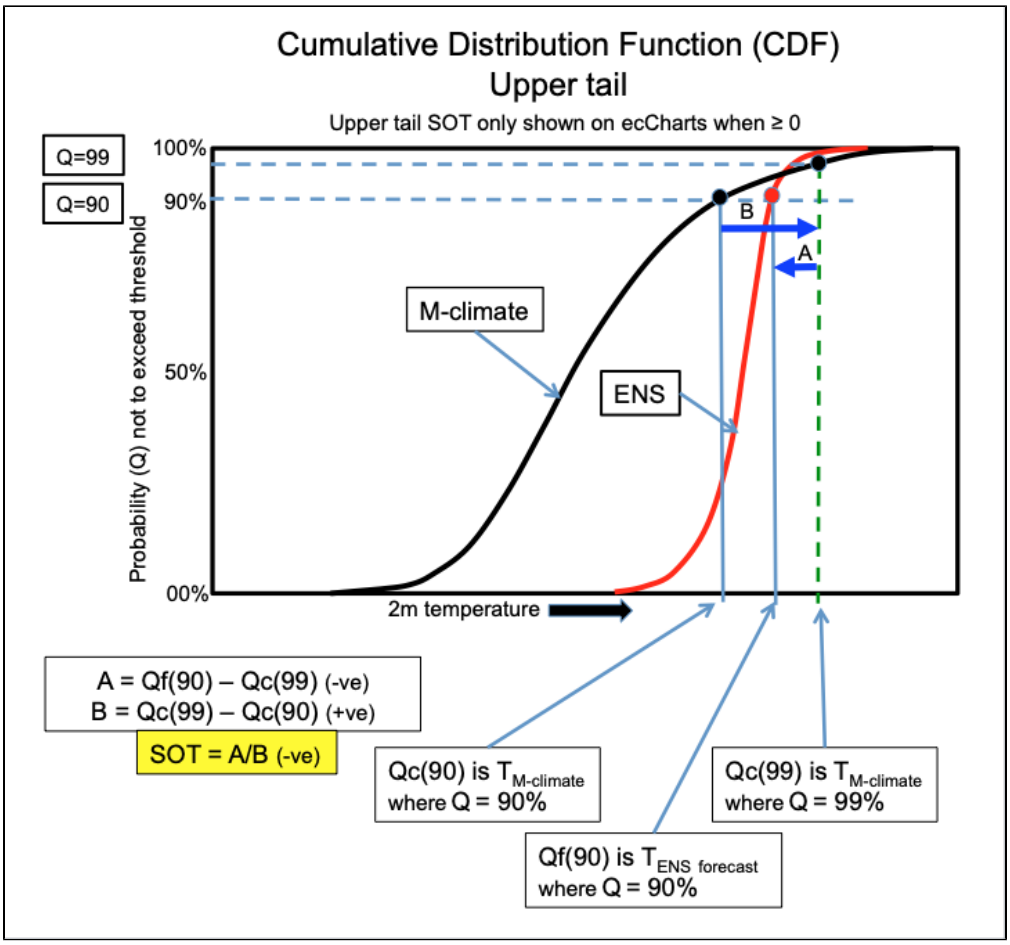

Fig8.1.4.9B: *Example corresponds to a fairly large positive EFI (red ENS forecast curve well noticeably to the right of the black M-Climate curve). The negative upper tail SOT (quantile 90) indicates that the warmest ENS members are not predicting an extreme warm outcome (above the 99th M-climate percentile shown by the dashed green line). However note that one ENS member (extreme top end of red curve) is relatively extreme (albeit still short of the extreme of the M-climate temperature distribution). This suggests warm temperatures may be confidently forecast (fairly large positive EFI) but will be unexceptional (SOT –0.7) compared with the M-climate, unless the single warm outlier solution discussed materialises.*

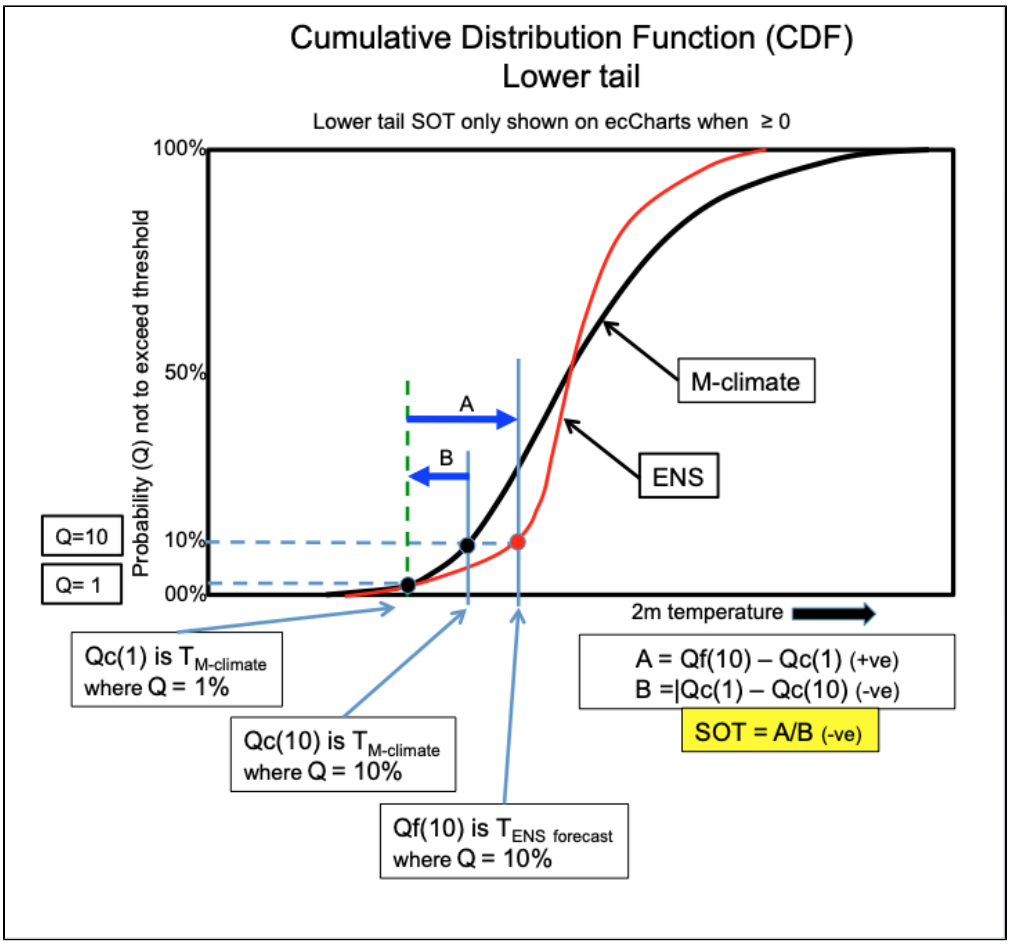

Fig8.1.4.9C: *This example has an EFI around zero, with red and black curves quite similar, suggesting that neither anomalous warmth nor anomalous cold are preferred solutions. The negative lower tail SOT (quantile 10) indicates that generally even the colder ENS members are not predicting an extreme cold temperature outcome. Indeed SOT~-1.7 is the "opposite" of extreme. The overall message here is that temperatures can be fairly confidently forecast to be around average.*

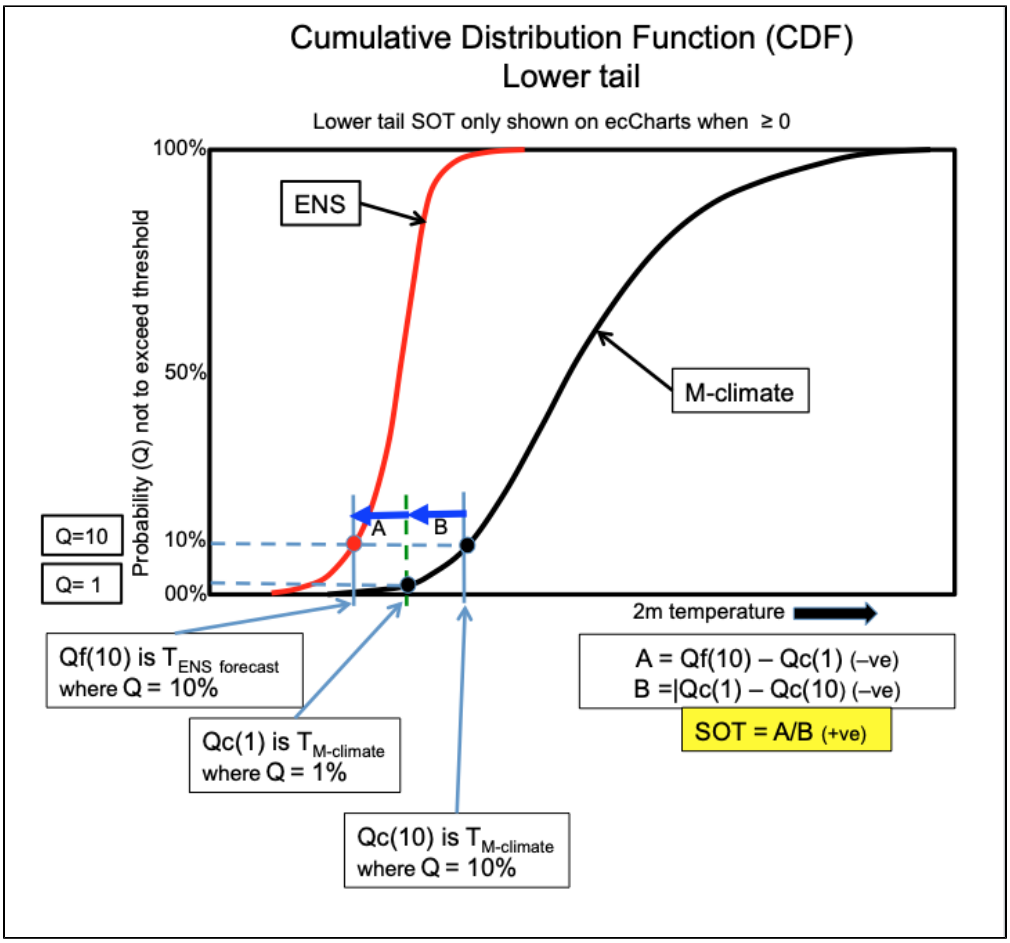

Fig8.1.4.9D: *This example has a large negative EFI, due to the red curve being a long way to the cold side of the black (M-Climate) curve. The positive lower tail SOT (quantile 10), of around +095, indicates there are several ENS members predicting extreme cold temperatures some way below the 1st M-climate percentile (shown by the dashed green line). So unusually cold temperatures may be confidently forecast (large negative EFI), and there is a possibility, denoted by large SOT, of an extreme cold outcome. The larger the lower tail SOT is the more extreme is the cold end of the ENS range.*

Updated/Amended 20/09/20 - Replaced and expanded explanation