Supplemental color figures for “A Sensorimotor Approach to Sound Localization” by Murat Aytekin, Cynthia F. Moss, and Jonathan Z. Simon, Neural Computation, Volume 20, Issue 3 (March 2008), pp. 603-635.

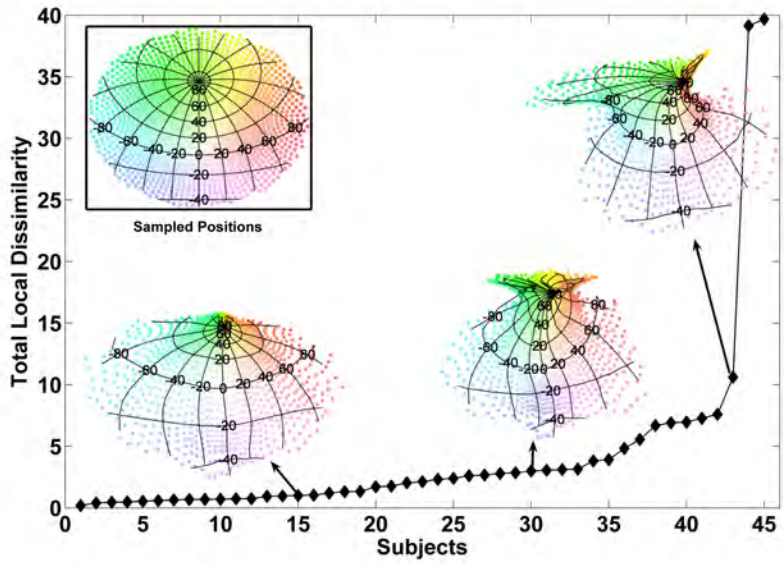
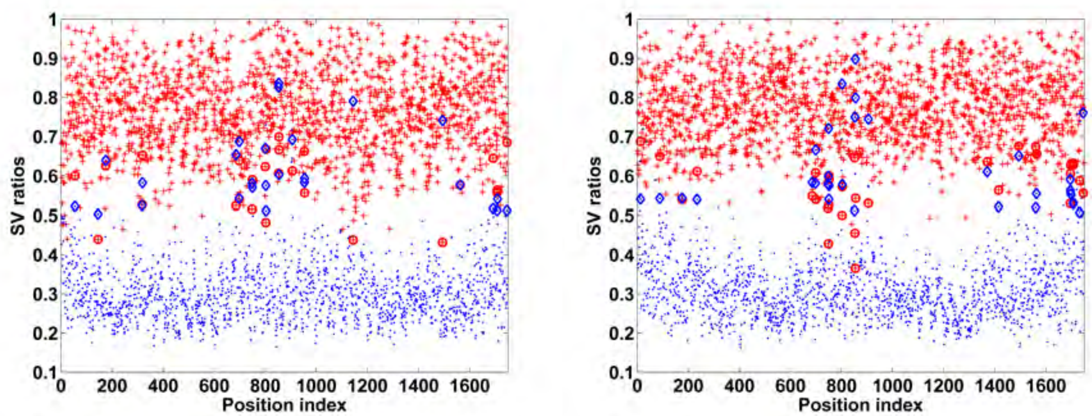


Figure 1. Total local dissimilarity for each subject. Spatial points are sampled from the hemisphere of interest in stereographic projection depicted in the inset. Positions are color coded to allow comparisons with the global parameter maps obtained from the manifold learning method. Global maps of three subjects corresponding to 15^{th} (subject 154), 30^{th} (subject 050) and 43^{rd} (subject 131) largest total local dissimilarity values are also shown (arrows). Manifold learning step failed to capture geometric organization of the spatial points for the subjects with two outlying local dissimilarity values, the 44^{th} (subject 008) and 45^{th} (subject 126).



(a) (b)

Figure 2. Singular value ratios $\frac{\sigma_2}{\sigma_1}$ and $\frac{\sigma_3}{\sigma_2}$, where $\sigma_1 \geq \sigma_2 \geq \ldots \geq \sigma_K$. a: subject 147 (lowest ranked total local dissimilarity) and b: subject 131 (43^{rd} ranked total local dissimilarity). Ratios obtained within the neighborhood of each point (total 1748 points uniformly distributed on the hemisphere) are depicted in '+' and '.' respectively. Moderate separation of the two sets of values implies full rank Jacobian matrix for 2-dimensional local tangent space. The ratios with potential rank deficiency problem are stressed with '$\circ$' (for $\frac{\sigma_2}{\sigma_1}$) and '$\diamond$' (for $\frac{\sigma_3}{\sigma_2}$). A local neighborhood is determined as problematic if the largest eigenvalue is moderately larger than the rest of them (if $\frac{\sigma_2}{\sigma_1} < 0.7$, $\frac{\sigma_3}{\sigma_2} > 0.5$).

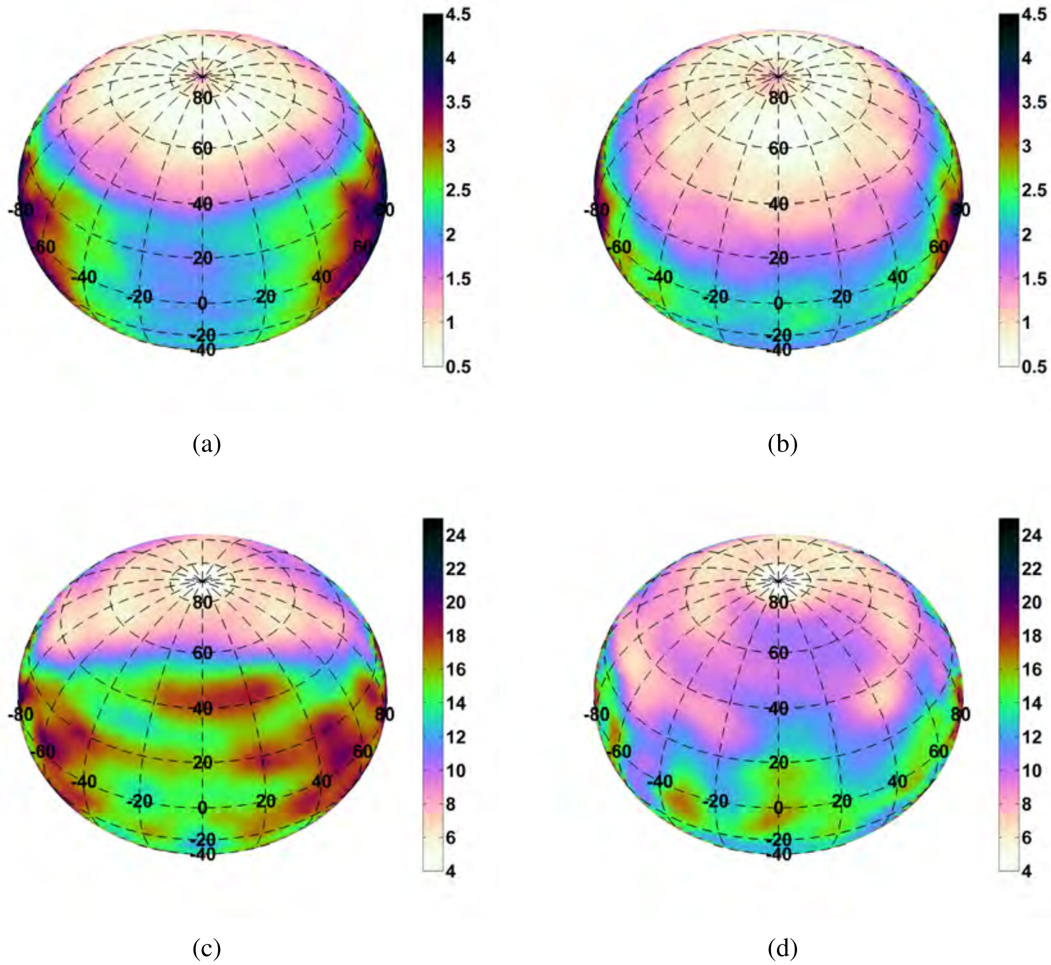
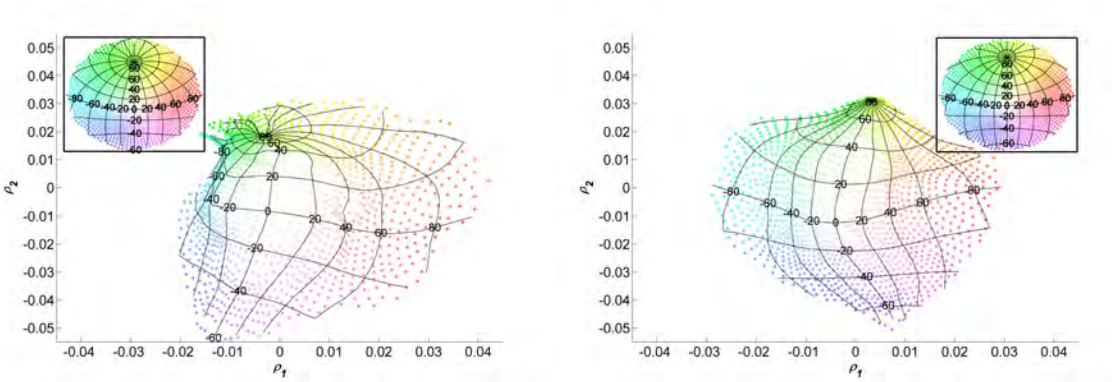


Figure 3. a, b: Mean local distances of learned extended-tangent vectors; c, d: Mean local distances of underlying head related transfer functions (HRTFs). Subject 147 in a and c; subject 131 in b and d. Mean distances are determined within each local neighborhood of uniformly distributed 1748 spatial positions on the hemisphere (a and b) with K-nearest neighborhood criteria (K=8). The local mean distance for each subject decreases with elevation and reaches its minimum value around the north pole. This property was common across all the subjects. Subject 147 (lowest total local dissimilarity) shows larger local distances below 60^o elevation in comparison to subject 131 (moderately high total local dissimilarity) for both type of local distances.



(a) (b)

Figure 4. Global coordinates of two echolocating bats. a: subject EF2 ; b: subject EF3. Similar to human subjects, global maps show increased density near the north pole. Sampled spatial positions (1707 points uniformly sampled on the hemisphere) are given in the insets of each subfigure. Global parameters obtained from both subjects preserved the topology of the sound-source locations given in the insets of each figure.

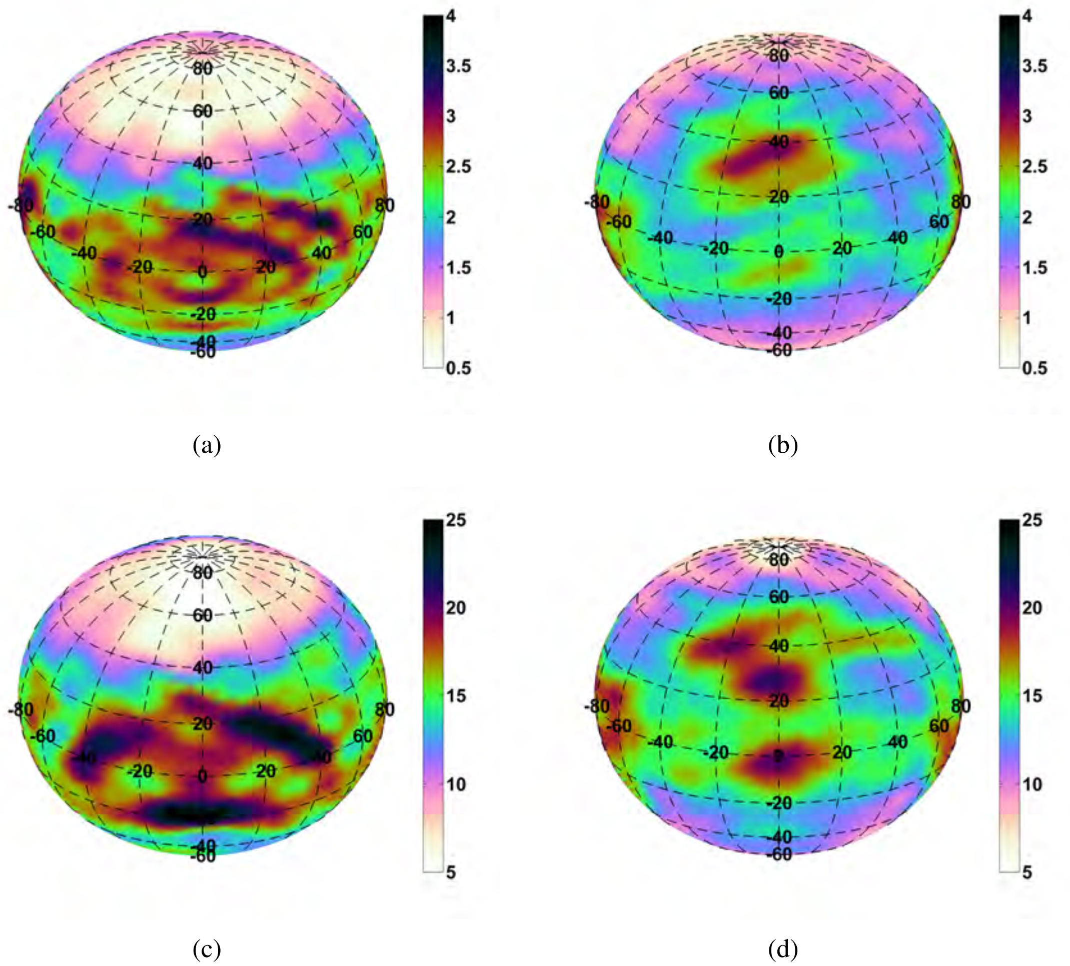


Figure 5. Mean local distances for two echolocating bats. a, b: Mean local distances of learned extended-tangent vectors; c, d: Mean local distances of underlying HRTFs. Subject EF2 in a and c; subject EF3 in b and d. Mean distances are determined within each local neighborhood of uniformly distributed 1707 spatial positions on the hemisphere (a and b) with K-nearest neighborhood criteria (K=8). The local mean distance for each subject decreases with elevation and reaches its minimum value near the north pole, similar to human subjects, and near the south pole (data for which was unavailable for human subjects).