Filtering has dominated the data processing scheme in the mass change and redistribution studies using GRACE time-variable gravity field. However, there has been a lack of a framework for the evaluation and analysis of the performance of the filters. An attempt is made in this contribution to design a set of measures for analysing the performance of low-pass spectral filter kernels on the sphere. These measures are predominantly based on the energy functional of the filter and the filtered field. They are used for evaluating six isotropic filters (Gauss, von Hann, Pellinen, Box-car, Butterworth and Diffusion) and three anisotropic filters (anisotropic Gauss, Swenson and Wahr destriping filter, and regularization filter). The performance analysis reinstates the fact that Gauss filters are the best isotropic filters when the signal is contaminated with high frequency noise. However, there are better isotropic filters available for changing the resolution of the dataset. A similar comparison between anisotropic filters seems to be difficult if not impossible, due to anisotropy and inhomogeneity of the filter kernels. Nevertheless, the measures allow for a detailed dissection and diagnosis of the individual anisotropic filters. In the course of this exercise, a classification scheme for the filter kernels was also devised, which enables the design of new filter kernels with the desired spectral structure. In conclusion, the measures provide a good understanding of the filter structure, filtering mechanism and performance of low-pass spectral filters, thereby enabling the user to choose the appropriate filter.