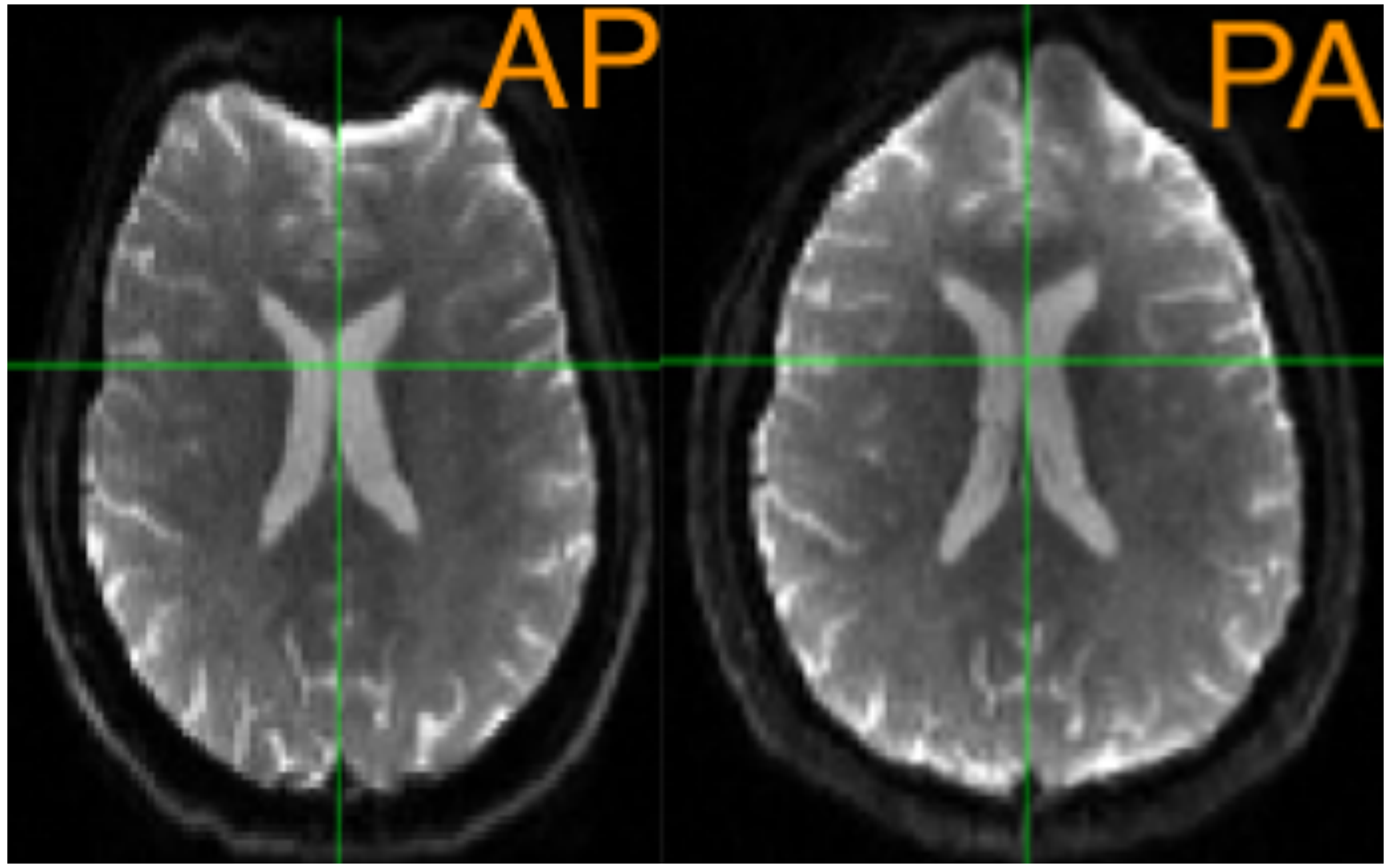
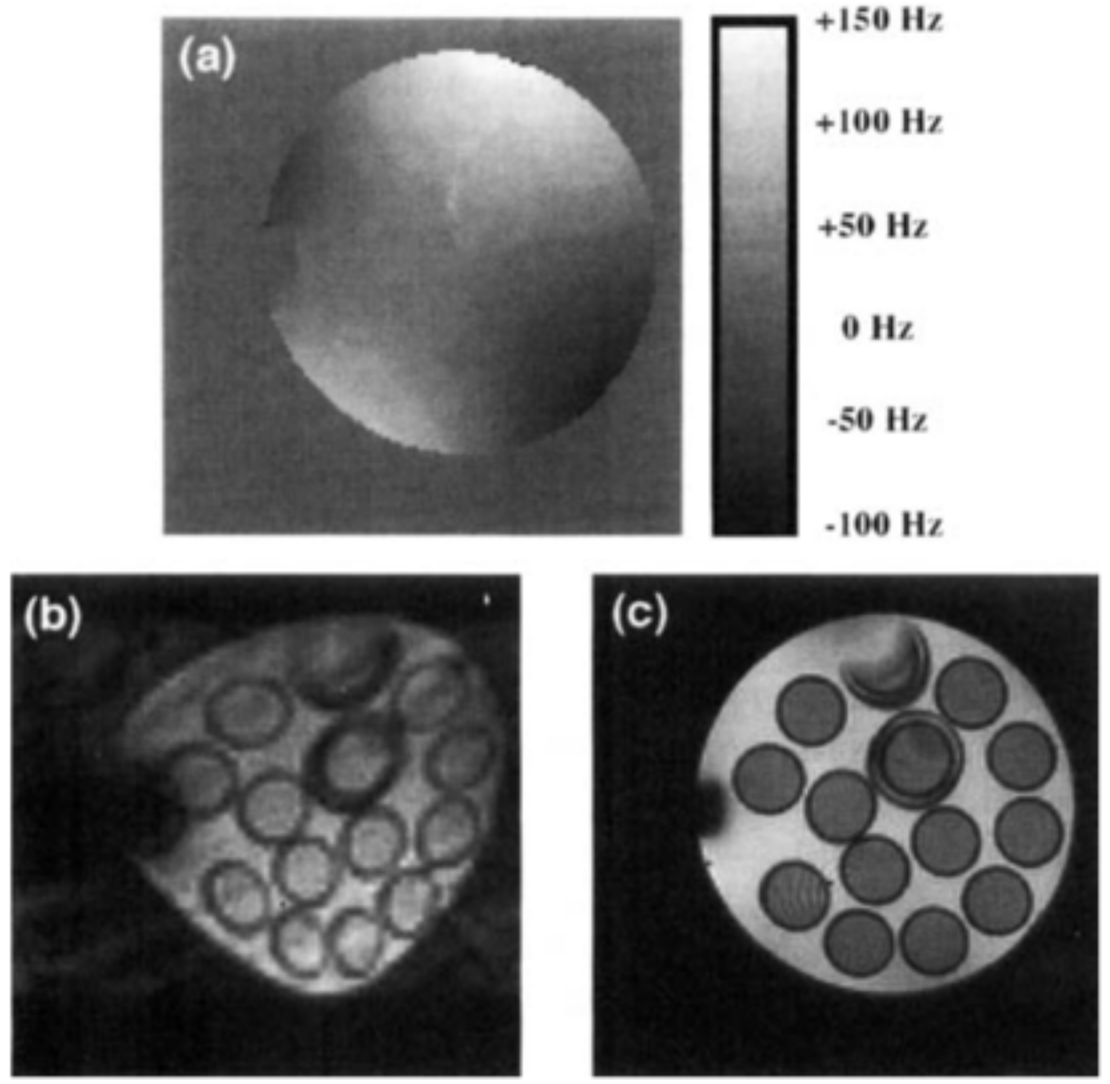
CORRECTION METHODS

- Field map based approaches
- Opposite PE based approaches
- Registration based approaches
- And like all else in life …



FIELD MAPS

- Calculate a field map based on the difference in phase between two different echos in a double echo sequence



Correction for Geometric Distortion in Echo Planar Images from B_0 Field Variations

Peter Jezzard, Robert S. Balaban

A method is described for the correction of geometric distortions occurring in echo planar images. The geometric distortions are caused in large part by static magnetic field inhomogeneities, leading to pixel shifts, particularly in the phase encode direction. By characterizing the field inhomogeneities from a field map, the image can be unwarped so that accurate alignment to conventionally collected images can be made. The algorithm to perform the unwarping is described, and results from echo planar images collected at 1.5 and 4 Tesla are shown.

Key words: echo planar imaging, EPI; geometric distortion; field map correction.

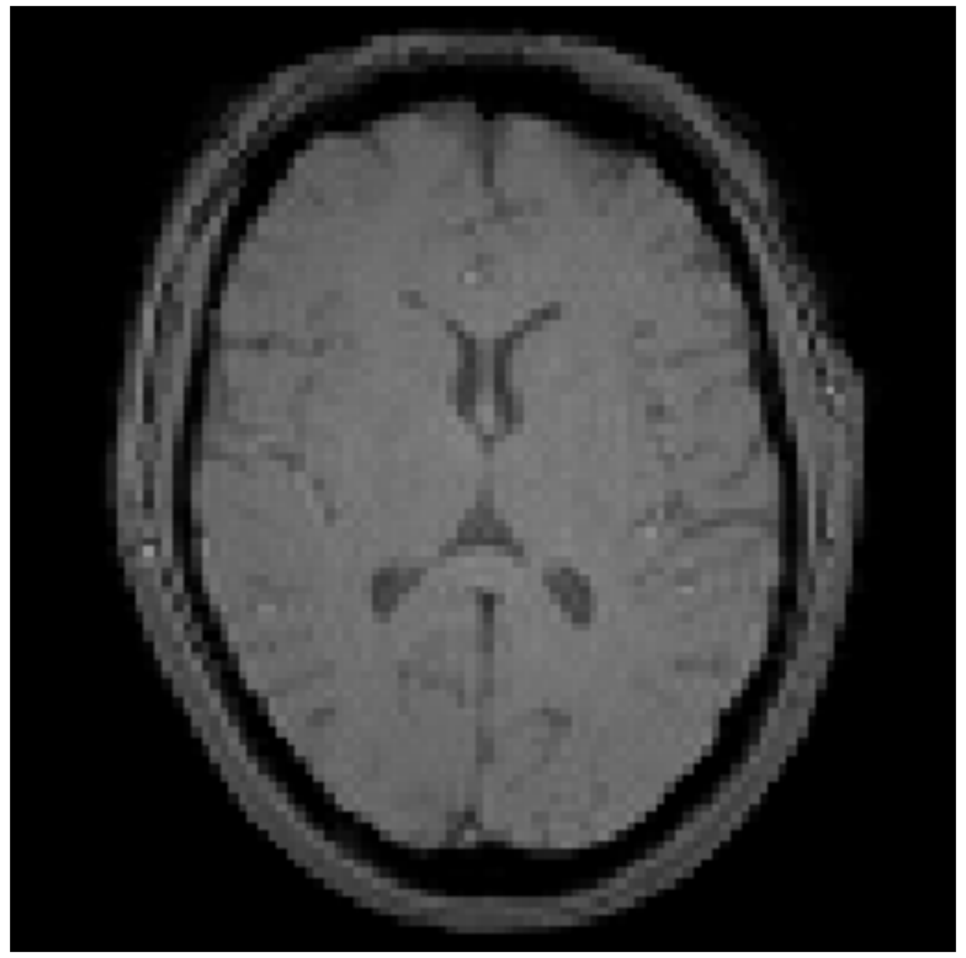
INTRODUCTION

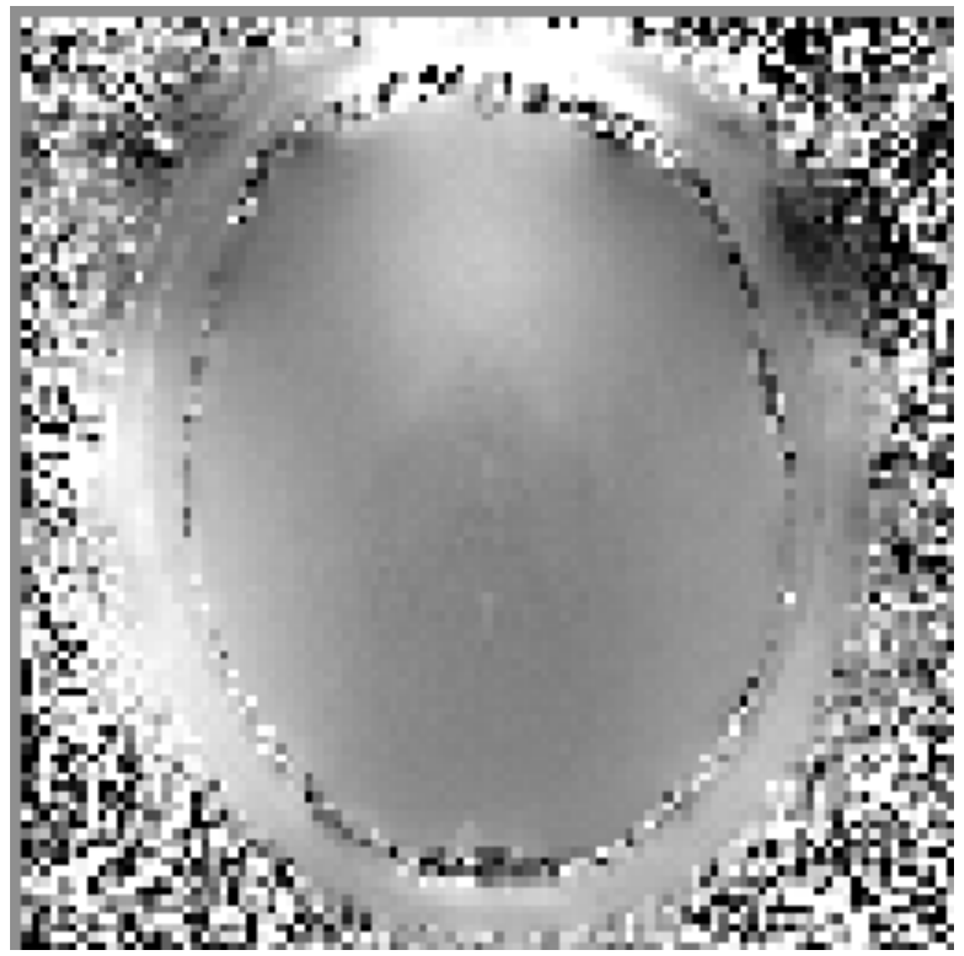
Echo planar imaging (EPI) was conceived and developed by Mansfield's group in Nottingham (1, 2) and further developed by others (3). Initially a little used sequence, ...

rior frontal regions. The magnetic field inhomogeneities cause pixels in the echo planar image to be shifted from where they should appear, and if the inhomogeneities are sufficiently bad, gross image distortion results. If the magnetic field inhomogeneities can be characterized by means of a residual field map throughout the volume of interest, then the distorted pixels can be relocated and intensity corrected to give a geometric distortion-free image. Accurate registration with high resolution anatomical images can then be made.

THEORY

The phase evolution of a pixel in a magnetic resonance image is dictated by the local magnetic field that it experiences. In general, for an elemental point in a volume of interest, the signal induced in the NMR receiver coil is ...





$$\Delta B_0(x, y, z) = (2\pi\gamma\Delta TE)^{-1}\Delta\phi(x, y, z).$$

Jezzard et. al. 1995