F-K Migration Details

4.4 FK direct Fourier transform migration

4.4.1 Introduction

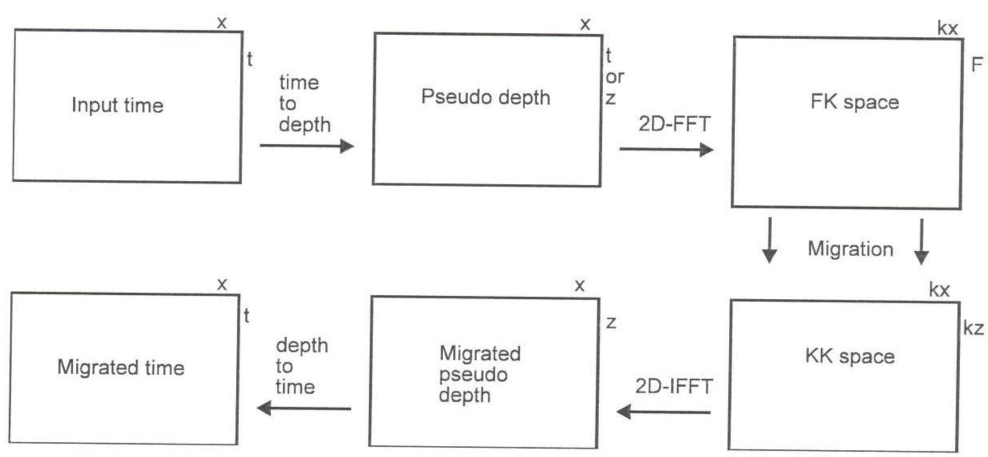
The direct Fourier Transform migration is a very fast method and was introduced by Stolt in 1978 [21]. The term FK is derived from the Fourier transform of time to frequency *F*, and distance to wave-number *K*.

The FK method is ideal when the velocities are constant and will migrate accurately to 90 degrees.

The FK domain loses the identity of the *x* and *z* positions of the data, and can only migrate a section with an apparent constant velocity. Variable velocities may be accommodated with a pseudo time-to-depth conversion that is performed on the input time section. (Strictly speaking, the input section remains a time section with constant velocity.)

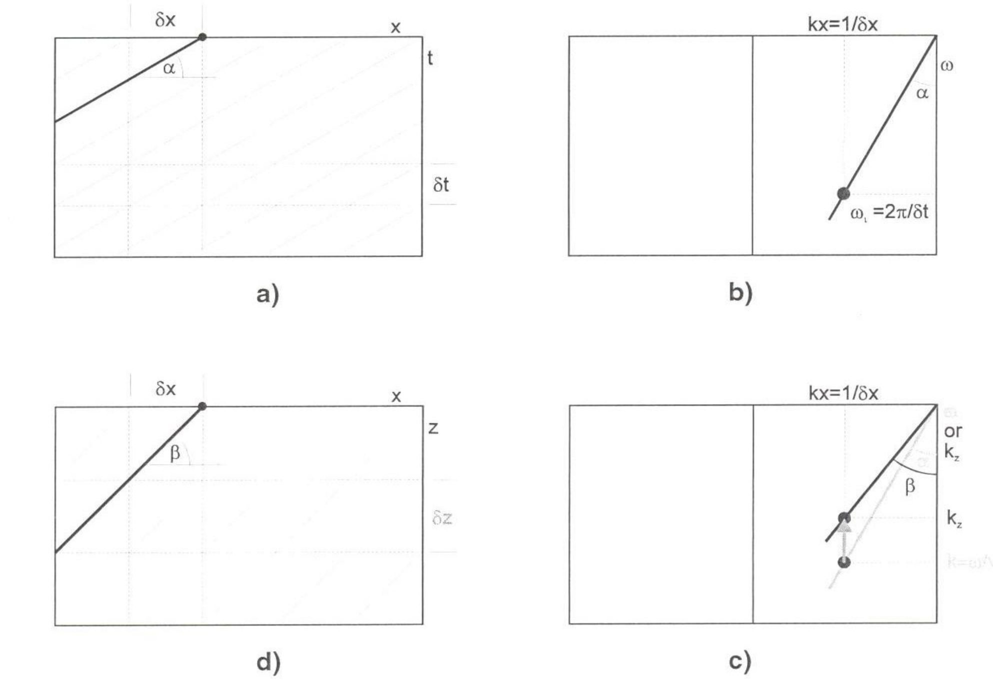
The typical procedure for the migration is

- Time to pseudo-depth conversion (constant velocity time section).
- 2-D Fourier transform.
- Migration in FK to KK space (kernel).
- Inverse 2-D transform.
- Pseudo-depth to time conversion.



The data movement in KK space may be illustrated by fig. 4.24.

- Recall that dips before and after migration hinge at the surface.
- Note the dip spacing δx in (a) and (d), and the related K_x, in (b) and (c).
- The different dip spacing for δt in (a) and δz in (c), and Kz and Km.
- Migration moves an FK point vertically to a new KK position.



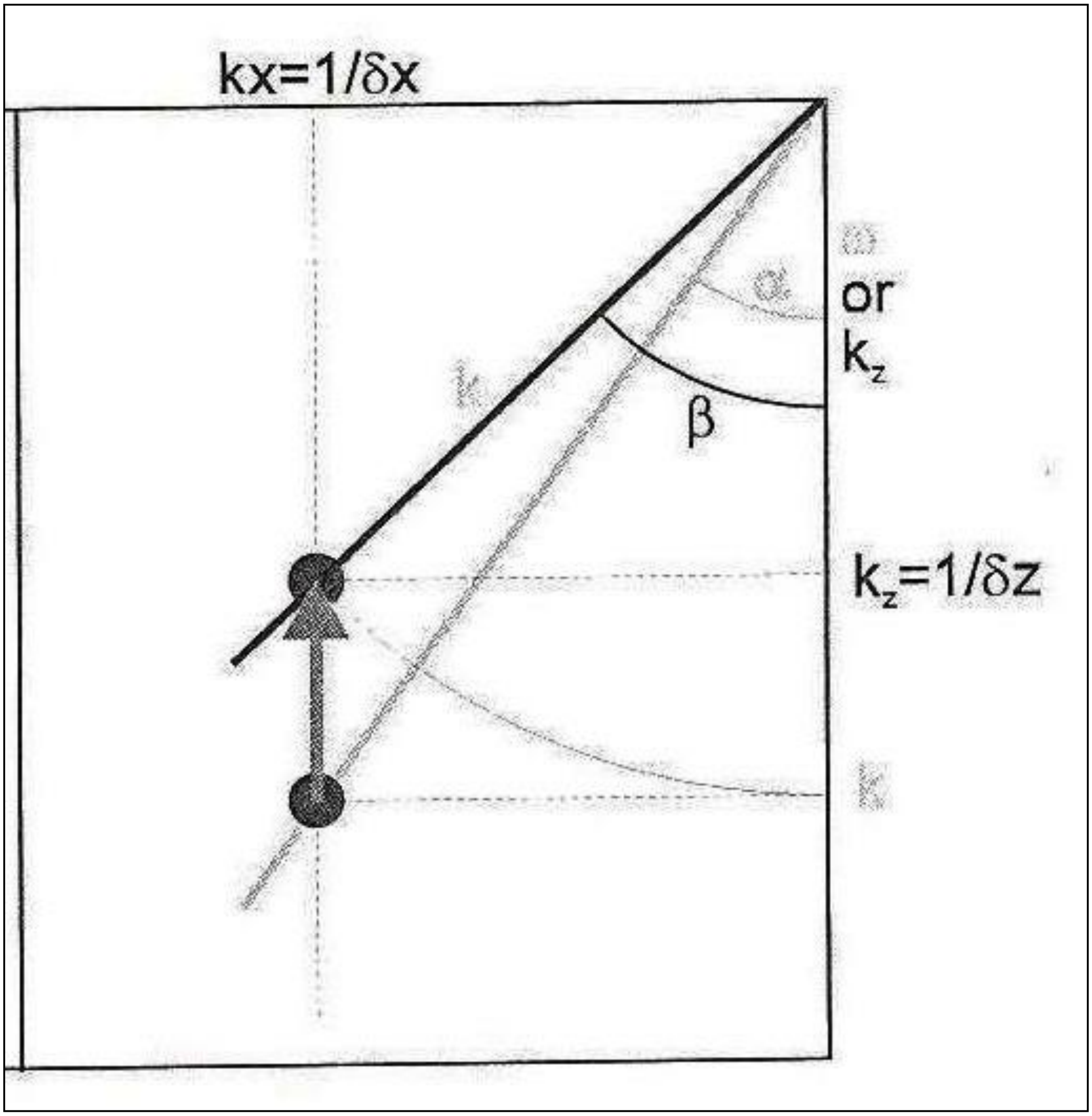
Figures 4.24. Illustration of movement on the FK and KK plane with a) showing a dip model, b) the FK transform, c) the KK migrated data, and d) the resulting migration on the *(x, z)* plane.

The actual migration position is quantified using Figure 4.25.

$$tan\alpha = \frac{delz}{delx}(x,z) = \frac{k_x}{k} = sin\beta, \tag{4.15}$$

therefore,

$$k_z^2 = \frac{\omega^2}{v^2} - k_x^2 = k^2 - k_x^2. \tag{4.16}$$



kx=1/δx
ω
or
k_z
k
α
β
k_z=1/δz
k