PARALLEL CODE: SPECTRAL SPACE DERIVATIVES

The big advantage of spectral codes is that derivatives are reduced to mere multiplications.

We need to understand the ordering of the k's so that we can create the multiplication matrices once and for all.

```
    ccx = two_pi/x_max

    Do ij = my_k%min,my_k%max
#ifdef T3E
       i = 1 + (ij-1)/(ny_dealias)
#endif
#ifdef SP2
       i = 1 + Mod(ij-1,nx_dealias/2)
#endif
       ikx(ij) = ccx*(i-1)
    End Do

    If (three_dimensional) Then
       Allocate(iky(my_k%min:my_k%max))
       ccy = two_pi/y_max
       Do ij = my_k%min, my_k%max
#ifdef T3E
          j = 1 + Mod(ij-1, ny_dealias)
          i = 1 + (ij-1)/(ny_dealias)
#endif
#ifdef SP2
          i = 1 + Mod(ij-1, nx_dealias/2)
          j = 1 + (ij-1)/(nx_dealias/2)
#endif
          If (j <= (ny_dealias+1)/2) Then
             iky(ij) = ccy*(j-1)
          Else
             iky(ij) = -ccy*(ny_dealias+1-j)
          End If

          ksqr(ij) = -ikx(ij)**2 - iky(ij)**2
       Enddo
    Else ! Two dimensional
       Do ij = my_k%min,my_k%max
          i = ij
          ksqr(ij) = -ikx(i)**2
       Enddo
    End If
    sqrt_ksqr = Sqrt(-ksqr)

       Allocate(kinv(my_k%min:my_k%max))
       If (my_k%min == 1) Then
          kinv(2:) = One/ksqr(2:)
          kinv(1)  = Zero
       Else
          kinv = One/ksqr
       End If
```