



```
#####
```

```
; $Id: velovect.pro,v 1.15 1998/06/26 22:13:02 griz Exp $
```

```
;
```

```
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```

```
; Unauthorized reproduction prohibited.
```

```
PRO MSVELOVECT,U,V,X,Y, Missing = Missing, Length = length, Dots = dots, $  
    Color=color, CLIP=clip, NOCLIP=noclip, OVERPLOT=overplot, $  
    NOZERO=nozero, _EXTRA=extra
```

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;
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;+
```

```
; NAME:
```

```
; MSVELOVECT
```

```
;
```

```
; PURPOSE:
```

```
; Produce a two-dimensional velocity field plot.
```

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;
```

```
; A directed arrow is drawn at each point showing the direction and  
; magnitude of the field.
```

```
;
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```
; This routine was developed from the original VELOVECT routine  
; and now allows two dimensional arrays for X and Y for irregularly  
; spaced data.
```

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;
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```
; CATEGORY:
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```
; Plotting, two-dimensional.
```

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;
```

```
; CALLING SEQUENCE:
```

```
; MSVELOVECT, U, V [, X, Y]
```

```
;
```

```
; INPUTS:
```

```
; U: The X component of the two-dimensional field.
```

```
; U must be a two-dimensional array.
```

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;
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```
; V: The Y component of the two dimensional field. Y must have  
; the same dimensions as X. The vector at point [i,j] has a  
; magnitude of:
```

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;
```

```
;  $(U[i,j]^2 + V[i,j]^2)^{0.5}$ 
```

```
;
```

```
; and a direction of:
```

```
;
```

```
;  $ATAN2(V[i,j],U[i,j])$ .
```

```
;
```

```
; OPTIONAL INPUT PARAMETERS:
```

```
; X: Optional abscissae values. X must be a vector with a length
```

```
; equal to the first dimension of U and V *OR* a 2-dimensional
```

```

;      array with the same dimensions as U and V.
;
;
; Y: Optional ordinate values. Y must be a vector with a length
; equal to the first dimension of U and V *OR* a 2-dimensional
;      array with the same dimensions as U and V.
;
;
; KEYWORD INPUT PARAMETERS:
; COLOR: The color index used for the plot.
;
;
; DOTS: Set this keyword to 1 to place a dot at each missing point.
; Set this keyword to 0 or omit it to draw nothing for missing
; points. Has effect only if MISSING is specified.
;
;
; LENGTH: Length factor. The default of 1.0 makes the longest (U,V)
; vector the length of a cell.
;      ### Franz Rohrer's modification of the LENGTH keyword:
;      LENGTH now applies a scale factor relative to the data values,
;      not just a relative scaling. If you don't specify LENGTH it acts
;      as before.
;
;
; MISSING: Missing data value. Vectors with a LENGTH greater
; than MISSING are ignored.
;
;
; OVERPLOT: Set this keyword to make VELOVECT "overplot". That is, the
; current graphics screen is not erased, no axes are drawn, and
; the previously established scaling remains in effect.
;
;
; NOZERO: Do not plot zero vectors as dots.
;
;
; Note: All other keywords are passed directly to the PLOT procedure
; and may be used to set option such as TITLE, POSITION,
; NOERASE, etc.
; OUTPUTS:
; None.
;
; COMMON BLOCKS:
; None.
;
; SIDE EFFECTS:
; Plotting on the selected device is performed. System
; variables concerning plotting are changed.
;
;
; RESTRICTIONS:
; None.
;
;
; PROCEDURE:
; Straightforward. Unrecognized keywords are passed to the PLOT
; procedure.

```

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;
; MODIFICATION HISTORY:
; DMS, RSI, Oct., 1983.
; For Sun, DMS, RSI, April, 1989.
; Added TITLE, Oct, 1990.
; Added POSITION, NOERASE, COLOR, Feb 91, RES.
; August, 1993. Vince Patrick, Adv. Visualization Lab, U. of Maryland,
; fixed errors in math.
; August, 1993. DMS, Added _EXTRA keyword inheritance.
; January, 1994, KDB. Fixed integer math which produced 0 and caused
; divide by zero errors.
; December, 1994, MWR. Added _EXTRA inheritance for PLOTS and OPLOT.
; June, 1995, MWR. Removed _EXTRA inheritance for PLOTS and changed
; OPLOT to PLOTS.
; September, 1996, GGS. Changed denominator of x_step and y_step vars.
; February, 1998, DLD. Add support for CLIP and NO_CLIP keywords.
; June, 1998, DLD. Add support for OVERPLOT keyword.
; 16 Sep 1999: Martin Schultz added support for 2D U and V arrays
; cleaned up the routine some and added the NOZERO keyword.
; (renamed as msvelovect.pro on Sep 23)
; Also included Franz Rohrer's modification of the LENGTH keyword:
; LENGTH now applies a scale factor relative to the data values,
; not just a relative scaling. If you don't specify LENGTH it acts
; as before.
;-
;
; on_error,2 ;Return to caller if an error occurs
; s = size(u)
; t = size(v)
; if s[0] ne 2 then begin
baduv: message, 'U and V parameters must be 2D and same size.'
; endif
; if total(abs(s[0:2]-t[0:2])) ne 0 then goto,baduv
;
; if n_params() lt 3 then x = findgen(s[1]) $
; else begin
; sx = size(x)
; if (sx[0] eq 2) then begin
; if total(abs(sx[0:2]-s[0:2])) ne 0 then begin
badx: message, 'X array has incorrect size.'
; endif
; endif else $
; if n_elements(x) ne s[1] then goto,badx
; endelse
;
; if n_params() lt 4 then y = findgen(s[2]) $
; else begin
; sy = size(y)

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    if (sy[0] eq 2) then begin
        if (sx[0] ne 2) then goto,bady
        if total(abs(sy[0:2]-s[0:2])) ne 0 then begin
bady:      message, 'Y array has incorrect size.'
        endif
    endif else $
        if n_elements(y) ne s[1] then goto,bady
    endelse
;
    if n_elements(missing) le 0 then missing = 1.0e30
; ### FR: use LENGTH differently -- allows absolute scaling
; if n_elements(length) le 0 then length = 1.0

    mag = sqrt(u^2.+v^2.)      ;magnitude.
        ;Subscripts of good elements
    nbad = 0                    ;# of missing points
; ## mgs: because of defaulting 5 lines above, missing always has a value!!
; if n_elements(missing) gt 0 then begin
    good = where(mag lt missing)
    if keyword_set(dots) then bad = where(mag ge missing, nbad)
; endif else begin
;     good = lindgen(n_elements(mag))
; endif
; endelse

    ugood = u[good]
    vgood = v[good]
    x0 = min(x)                ;get scaling
    x1 = max(x)
    y0 = min(y)
    y1 = max(y)
x_step=(x1-x0)/(s[1]-1.0) ; Convert to float. Integer math
y_step=(y1-y0)/(s[2]-1.0) ; could result in divide by 0

    maxmag=max([max(abs(ugood/x_step)),max(abs(vgood/y_step))])
; ### FR:
    if n_elements(length) gt 0 then maxmag=length/x_step
    sina = (ugood/maxmag)
    cosa = (vgood/maxmag)
; ### original:
; sina = length * (ugood/maxmag)
; cosa = length * (vgood/maxmag)
;
    if n_elements(title) le 0 then title = "
;----- plot to get axes -----
    if n_elements(color) eq 0 then color = !p.color
    if n_elements(noclip) eq 0 then noclip = 1
    x_b0=x0-x_step
x_b1=x1+x_step

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y_b0=y0-y_step
y_b1=y1+y_step
  if (not keyword_set(overplot)) then begin
;   if n_elements(position) eq 0 then begin
      plot,[x_b0,x_b1],[y_b1,y_b0],/nodata,/xst,/yst, $
      color=color, _EXTRA = extra
;   endif else begin
;   plot,[x_b0,x_b1],[y_b1,y_b0],/nodata,/xst,/yst, $
;   color=color, _EXTRA = extra
;   endelse
endif
if n_elements(clip) eq 0 then $
  clip = [!x.crange[0],!y.crange[0],!x.crange[1],!y.crange[1]]
;
r = .3           ;len of arrow head
angle = 22.5 * !dtr   ;Angle of arrowhead
st = r * sin(angle)   ;sin 22.5 degs * length of head
ct = r * cos(angle)
;
for i=0,n_elements(good)-1 do begin   ;Each point
  if (sx[0] eq 2) then begin
    x0 = x[good[i]]   ;get coords of start & end
    y0 = y[good[i]]
  endif else begin
    x0 = x[good[i] mod s[1]]   ;get coords of start & end
    y0 = y[good[i] / s[1]]
  endelse
    dx = sina[i]
    x1 = x0 + dx
    dy = cosa[i]
    y1 = y0 + dy
xd=x_step
yd=y_step
  ; plot zero vectors as dots
  if (mag[i] eq 0.) then begin
    if (not keyword_set(NOZERO)) then $
      plots,x[i],y[i],psym=3,color=color,clip=clip, $
      noclip=noclip
    endif else $
      plots,[x0,x1,x1-(ct*dx/xd-st*dy/yd)*xd, $
x1,x1-(ct*dx/xd+st*dy/yd)*xd], $
      [y0,y1,y1-(ct*dy/yd+st*dx/xd)*yd, $
y1,y1-(ct*dy/yd-st*dx/xd)*yd], $
      color=color,clip=clip,noclip=noclip
  endifor
  if nbad gt 0 then begin
    if (sx[0] eq 2) then begin   ;Dots for missing?
      PLOTS, x[bad], y[bad], psym=3, color=color, $

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```
        clip=clip,noclip=noclip
endif else begin
    PLOTS, x[bad mod s[1]], y[bad / s[1]], psym=3, color=color, $
        clip=clip,noclip=noclip
endelse
endif

end
```

## File Attachments

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1) [msvelovect.pro](#), downloaded 112 times

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