

短報

市販ソフト(MS-パワーポイント)を利用した
海況自動観測ブイデータの作図方法

青山裕晃

Drawing method of telemeter buoy data by MS-Powerpoint

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キーワード；自動観測ブイ，作図，パワーポイント，VBA

気象海象の変動を迅速に漁業者に伝達することにより、漁業の適性管理を図り、漁業経営の安定に資することを目的として三河湾に自動観測ブイが3基設置されている。このデータは、ブイ旬報(10日毎)および貧酸素情報(夏期：月1回)として郵送あるいはFAXにより迅速に関係機関に伝達され、ノリ養殖や採貝漁業の操業管理に広く利用されている。

また、平成6年度のアサリの大量へい死¹⁾や平成8年度春季のハブト藻類の大規模赤潮²⁾といった突発的な異常事態においてもその機構解明に関する重要な知見がブイデータから得られ、長・短期の海洋環境変動をリアルタイムで取得できる有用性と利便性が評価されている。

しかし、これらブイデータは、これまでFORTRANまたはC言語にて作成された描画プログラムを利用して公表されていたが、近年のインターネットの普及により漁業者やそれ以外からもブイ情報の直接提供が求められるようになってきており、充実したホームページ作成のためにもカラー表示等により、より視認性の高い自動観測ブイデータの掲載方法の検討が必要になってきた。そこで筆者は、入手が容易で修得・改変も容易な市販ソフトを利用して自動観測ブイデータのカラー作図手法を考案したので報告する。

材料および方法

マイクロソフト社製プレゼンテーションソフト(MS-パワーポイント97)のマクロ機能(VBA;Visual Basic Applications)を用いて、自動観測ブイデータ³⁾の内、

NO.1ブイの1ヶ月分を描画した。自動観測ブイデータはASCII形式のファイルをVBAを用いて読み込んだ後、パワーポイント上の座標へ線分、矢印および文字を指定することによって行った。VBAを利用した描画プログラムソースは付表1に記載した。描画項目は、水温、塩分、溶存酸素飽和度、流向流速および風向風速とし、風向風速以外は上層(海面下3.5m)と下層(海底上2m)について描画した。また、風向風速は流向流速に合わせて吹き去る方向と大きさを矢印によりベクトル表示した。

結果および考察

1998年4月のNo.1ブイの結果の描画例として図1に示す。上層の値を実線で、下層の値を鎖線で示した。モニター上ではカラー表示でき、視認性がより高くなっている。これまでブイ旬報等では表示していなかった風向風速および流向流速を他の水質項目と同時に描画したことにより、水塊の動きや成層状況が直感的に把握できるようになった。

また、従来水産試験場で使用していた描画プログラムでは、特定のレーザープリンターを用いる必要があったが、今回作成した方法ではプリンターを限定することなく、カラー印刷も出力可能となった。さらに、ファイル形式をGIF形式に変換することによりホームページに載せることも可能である。

視認性の高いベクトル図の作成が修得し易く入手し易い市販ソフトの活用により可能になったことは、ブイデ

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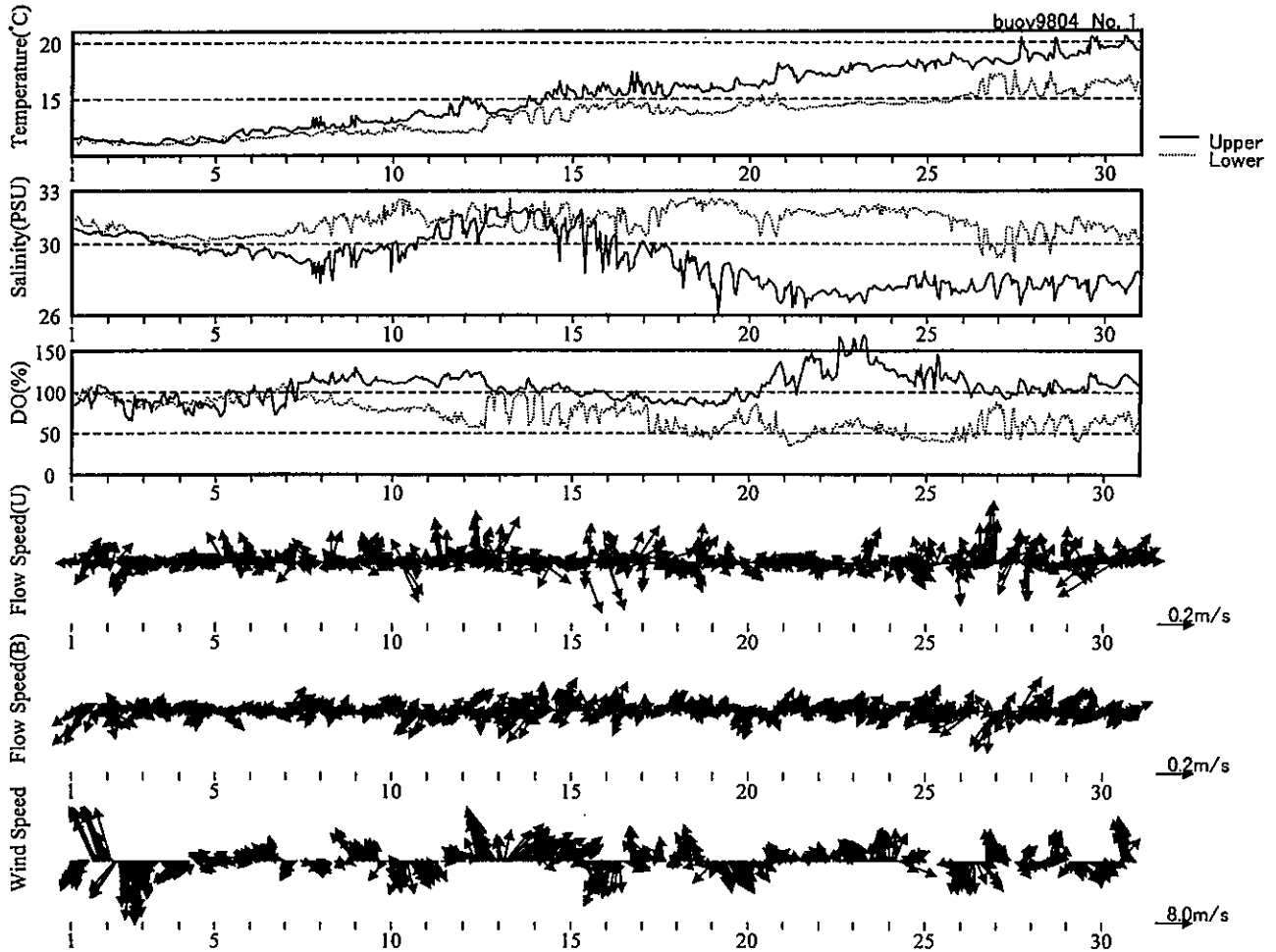


図1 1998年4月のNo.1自動観測ブイデータ (水温, 塩分, 溶存酸素飽和度, 流向流速および風向風速)

ータを始めとする本県の海洋環境情報のインターネット等での利用を広げるなどその活用範囲は大きいと考えられる。

文 献

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- 2) Kai M., T. Hara, H. Aoyama, and N. Kuroda (1999) A Massive Cocolithophorid Bloom Observed in Mikawa Bay, Japan. *Journal of Oceanography*, 55, 395-406.
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付表1 VBAソースプログラム

```

'自動観測バイデータの作図プログラム
'2000/06/07 青山裕光 作成
' 08/03 version up
' PolyLine で描画しスピードアップさせた。
' ツール(1)→マクロ(M)→マクロ(M)→"main"-実行(R) で起動
Option Explicit
Option Base 1
Const dx As Single = 0.8
Const g_width = 70
Const n = 745
Const rand = 3.14159265358979 / 180#
'メインプログラム
Sub main()
    Dim FN As String
    Dim i As Integer
    Dim x As Single, y As Single
    Dim buf As String
    Dim S As String
    Dim SS As String
    Dim L As Integer, L1 As Integer, L2 As Integer
    Dim skip1 As String, skip2 As String, skip3 As String
    Dim k As Integer, m As Integer
    Dim xx As Single
    Dim temp_u(n) As Single, sal_u(n) As Single, oxg_u(n) As Single
    Dim temp_b(n) As Single, sal_b(n) As Single, org_b(n) As Single
    Dim wdeg_u(n) As Integer, wdeg_b(n) As Integer
    Dim wspeed_u(n) As Single, wspeed_b(n) As Single
    Dim bdeg(n) As Integer
    Dim bspeed(n) As Single
    Dim flag As Integer, flagB As Integer
    Dim tempMax As Single, salMax As Single
    Dim tempMin As Single, salMin As Single
    Dim underV As Single

    tempMax = 0#
    tempMin = 90#
    salMax = 0#
    salMin = 90#
    ' 作図用の新しいファイル作成
    Presentations.Open FileName:=
    "C:\Program Files\Microsoft Office\Templates\新しいプレゼンテーション.pot", _
    Untitled:=msoTrue
    ActiveWindow.View.GotoSlide Index:=
    ActivePresentation.Slides.Add(Index:=1, _
    Layout:=ppLayoutBlank), SlideIndex

    ' データファイル名及びバイ番号入力
    SS = InputBox("データファイル名とバイ番号をカンマ区切りで、" &
    Chr(13) & Chr(10) & "を入力してください。" & Chr(13) & Chr(10) &
    Chr(13) & Chr(10) & "ex. BU09904, 1" & Chr(13) & Chr(10) &
    Chr(13) & Chr(10) & " Written by H.Aoyama on 2000/08/03")
    L = Len(SS)
    If L < 1 Then
        MsgBox ("引数が入力されていません。プログラムを終了します。")
        Exit Sub
    End If
    L1 = InStr(1, SS, ",")
    FN = Trim(Left(SS, L1 - 1))
    flagB = Val(Right(SS, L - L1 - 1))
    Open FN For Input As #1
    Call PrintStrings(550, 5, FN & " No. " & Format(flagB))
    k = 0
    Do While Not EOF(1)
        Line Input #1, skip1
        Line Input #1, skip2
        Line Input #1, skip3
        Select Case flagB
            Case 1
                buf = skip1
            Case 2
                buf = skip2
            Case 3
                buf = skip3
            Case Else
                MsgBox ("引数が異常です。プログラムを終了します。")
                Exit Sub
        End Select
        k = k + 1
        temp_u(k) = Val(Mid(buf, 10, 5))
        sal_u(k) = Val(Mid(buf, 15, 5))
        oxg_u(k) = Val(Mid(buf, 20, 3))
        wdeg_u(k) = Val(Mid(buf, 30, 3))
        wspeed_u(k) = Val(Mid(buf, 33, 5))
        temp_b(k) = Val(Mid(buf, 38, 5))
        sal_b(k) = Val(Mid(buf, 43, 5))
        org_b(k) = Val(Mid(buf, 48, 3))
        wdeg_b(k) = Val(Mid(buf, 58, 3))
        wspeed_b(k) = Val(Mid(buf, 61, 5))
        bdeg(k) = Val(Mid(buf, 72, 3))
        bspeed(k) = Val(Mid(buf, 75, 5))
    Loop
    For i = 1 To k
        If temp_u(i) > tempMax And temp_u(i) < 90# Then
            tempMax = temp_u(i)
        End If
        If temp_b(i) > tempMax And temp_b(i) < 90# Then
            tempMax = temp_b(i)
        End If
        If temp_u(i) < tempMin Then
            tempMin = temp_u(i)
        End If
        If temp_b(i) < tempMin Then
            tempMin = temp_b(i)
        End If
        If sal_u(i) > salMax And sal_u(i) < 90# Then
            salMax = sal_u(i)
        End If
        If sal_b(i) > salMax And sal_b(i) < 90# Then
            salMax = sal_b(i)
        End If
        If sal_u(i) < salMin Then
            salMin = sal_u(i)
        End If
        If sal_b(i) < salMin Then
            salMin = sal_b(i)
        End If
    Next i
    ' 水温図の作成
    x = 60#
    y = 90#
    tempMax = Int(tempMax + 0.99)
    tempMin = Int(tempMin)
    underV = Int(tempMin / 5)
    m = Int(tempMax / 5) - underV
    If m > 1 Then
        For i = 1 To m
            Call grid(x, y, k, (underV + i) * 5#, tempMax, tempMin, 1)
        Next i
    Else
        Call grid(x, y, k, tempMax, tempMax, tempMin, 0)
        Call grid(x, y, k, tempMin, tempMin, tempMin, 0)
    End If
    If m = 1 Then
        Call grid(x, y, k, (underV + 1) * 5#, tempMax, tempMin, 1)
    End If
    Call box(x, y, k)
    Call x_label(x, y, k / 24)
    Call DrawGraph(x, y, temp_u, k, tempMax, tempMin, 255, 0, 0, 90#) ' 赤
    Call DrawGraph(x, y, temp_b, k, tempMax, tempMin, 0, 255, 0, 90#) ' 緑
    Call y_title(x, y, "Temperature(°C)", 10)
    xx = x + k * dx + 10
    Call DrawLineEX(xx, y - 10, xx + 20, y - 10, 255, 0, 0)
    Call PrintStrings(xx + 20, y - 22, "Upper")
    Call DrawLineEX(xx, y + 20, y, 0, 255, 0, 0)
    Call PrintStrings(xx + 20, y - 12, "Lower")
    ' 塩分図の作成
    y = 180#
    salMax = Int(salMax + 0.99)
    salMin = Int(salMin)
    underV = Int(salMin / 5)
    m = Int(salMax / 5) - underV
    If m > 1 Then
        For i = 1 To m
            Call grid(x, y, k, (underV + i) * 5#, salMax, salMin, 1)
        Next i
    Else
        Call grid(x, y, k, salMax, salMax, salMin, 0)
        Call grid(x, y, k, salMin, salMin, salMin, 0)
    End If
    If m = 1 Then
        Call grid(x, y, k, (underV + 1) * 5#, salMax, salMin, 1)
    End If
    Call DrawGraph(x, y, sal_u, k, salMax, salMin, 255, 0, 0, 90#) ' 赤
    Call DrawGraph(x, y, sal_b, k, salMax, salMin, 0, 255, 0, 90#) ' 緑
    Call y_title(x, y, "Salinity(PSU)", 10)
    Call box(x, y, k)
    Call x_label(x, y, k / 24)
    ' 流速図の作成
    y = 270#
    Call grid(x, y, k, 150, 150, 0, 0)
    Call grid(x, y, k, 100, 150, 0, 0)
    Call grid(x, y, k, 50, 150, 0, 0)
    Call grid(x, y, k, 0, 150, 0, 0)
    Call DrawGraph(x, y, oxg_u, k, 150, 0, 255, 0, 0, 90#) ' 赤
    Call DrawGraph(x, y, oxg_b, k, 150, 0, 0, 255, 0, 90#) ' 緑
    Call y_title(x, y, "DO(%)", 10)
    Call box(x, y, k)
    Call x_label(x, y, k / 24)
    ' 表層流向流速図の作成
    y = 355#
    Call FlowGraph(x, y, wdeg_u, wspeed_u, k, 255, 0, 0) ' 赤
    Call x_label(x, y, k / 24)
    Call y_title(x, y, "Flow Speed(U)", 10)
    xx = x + k * dx + 10
    Call DrawArrowEX(xx, y, xx + 20, y, 0, 0, 0)
    Call PrintStrings(xx, y - 20, "0.2m/s")
    ' 下層流向流速図の作成
    y = 440#
    Call FlowGraph(x, y, wdeg_b, wspeed_b, k, 0, 255, 0) ' 緑
    Call x_label(x, y, k / 24)
    Call y_title(x, y, "Flow Speed(B)", 10)
    xx = x + k * dx + 10
    Call DrawArrowEX(xx, y, xx + 20, y, 0, 0, 0)
    Call PrintStrings(xx, y - 20, "0.2m/s")
    ' 風向風速図の作成
    y = 525#
    Call blwGraph(x, y, bdeg, bspeed, k, 0, 0, 255) ' 青
    Call x_label(x, y, k / 24)
    Call y_title(x, y, "Wind Speed", 10)
    xx = x + k * dx + 10
    Call DrawArrowEX(xx, y, xx + 20, y, 0, 0, 0)
    Call PrintStrings(xx, y - 20, "8.0m/s")
    Close #1
End Sub
' グラフ描画サブルーチン
Sub box(x As Single, y As Single, L As Integer)
    Dim Point(5, 2) As Single
    Dim myDocument As Object
    Set myDocument = ActivePresentation.Slides(1).Shapes
    With myDocument.AddShape(msoShapeRectangle, x, y - g_width, L * dx, g_width)
        .Fill.Visible = msoFalse
        .Line.DashStyle = msoLineSolid
        .Line.ForeColor = RGB(0, 0, 0)
        .Line.Weight = 1.5
    End With
End Sub
' 縦目盛線サブルーチン
Sub x_label(x As Single, y As Single, D As Integer)
    Dim i As Integer
    Dim myDocument As Object
    Dim xl As Single, yl As Single
    Dim x2 As Single, y2 As Single
    With ActivePresentation.DefaultShapes
        .Line.Weight = 0.75
        .Line.DashStyle = msoLineSolid
        .Line.Style = msoLineSingle
        .Line.ForeColor = RGB(0, 0, 0)
        .Line.Visible = msoTrue
        .Fill.Visible = msoFalse
    End With
    With ActivePresentation.SlideMaster.TextStyles
        Item(Type:=ppDefaultStyle).Levels(Level:=1).Font
        .NameOther = "MS Pゴシック"
        .NameFarEast = "MS Pゴシック"
        .NameAscii = "Times New Roman"
        .Size = 10
        .Bold = msoFalse
        .Italic = msoFalse
        .Underline = msoFalse
        .Shadow = msoFalse
        .Emboss = msoFalse
        .BaselineOffset = 0
        .AutoRotateNumbers = msoTrue
        .Color.SchemeColor = ppForegroundColor
    End With
    Set myDocument = ActivePresentation.Slides(1)

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For i = 1 To D
  xl = x + (i - 1) * 24# * dx
  yl = y + 4#
  x2 = xl + 6#
  y2 = yl + 6#
  myDocument.Shapes.AddLine(xl, y, xl, yl).Select
  If i = 1 Then
    With myDocument.Shapes.AddShape(msoShapeRectangle, xl - 8#, _
      y2, 16#, 12#)
      .TextFrame.TextRange.Text = Format(i, "#0")
      .Line.Visible = msoFalse
    End With
  End If
  If Mod 5 = 0 Then
    With myDocument.Shapes.AddShape(msoShapeRectangle, xl - 8#, _
      y2, 16#, 12#)
      .TextFrame.TextRange.Text = Format(i, "#0")
      .Line.Visible = msoFalse
    End With
  End If
Next i
End Sub
' 軸目盛線描画サブルーチン
Sub grid(x As Single, y As Single, L As Integer, data As Single, _
  Dmax As Single, Dmin As Single, flag As Integer)
  Dim myDocument As Object
  Dim xl As Single, yl As Single
  Dim x2 As Single, y2 As Single
  With ActivePresentation.DefaultShape
    .Line.Weight = 0.75
    .Line.DashStyle = msoLineDash
    .Line.Style = msoLineSingle
    .Line.ForeColor.RGB = RGB(0, 0, 0)
    .Line.Visible = msoTrue
    .Fill.Visible = msoFalse
  End With
  With ActivePresentation.SlideMaster.TextStyles _
    Item(Type:=ppDefaultStyle, Levels(1)=1).Font
    .NameOther = "MS Pゴシック"
    .NameFarEast = "MS Pゴシック"
    .NameAscii = "Times New Roman"
    .Size = 10
    .Bold = msoFalse
    .Italic = msoFalse
    .Underline = msoFalse
    .Shadow = msoFalse
    .Emboss = msoFalse
    .BaselineOffset = 0
    .AutoRotateNumbers = msoTrue
    .Color.SchemeColor = ppForeground
  End With
  Set myDocument = ActivePresentation.Slides(1)
  xl = x + L * dx
  yl = y - (data - Dmin) / (Dmax - Dmin) * g_width
  If flag = 1 Then
    myDocument.Shapes.AddLine(xl, yl, xl, yl).Select
  End If
  With ActivePresentation.DefaultShape
    .Line.Weight = 0.75
    .Line.DashStyle = msoLineDash
    .Line.Style = msoLineSingle
    .Line.ForeColor.RGB = RGB(0, 0, 0)
    .Line.Visible = msoTrue
    .Fill.Visible = msoFalse
  End With
  With myDocument.Shapes.AddShape(msoShapeRectangle, x - 20#, _
    yl - 6#, 16#, 12#)
    .TextFrame.TextRange.Text = Format(data, "#0")
    .Line.Visible = msoFalse
  End With
End Sub
' Y軸タイトル描画サブルーチン
Sub y_title(x As Single, y As Single, S As String, Esz As Integer)
  ActiveWindow.Selection.SlideRange.Shapes.AddLabel( _
    msoTextOrientationVerticalForEast, x - 50, y - g_width, x - 30, _
    y - g_width + 20).Select
  ActiveWindow.Selection.ShapeRange.TextFrame.TextRange.Characters( _
    Start:=1, Length:=0).Select
  With ActiveWindow.Selection.TextRange
    .Text = S
    With .Font
      .NameOther = "Times New Roman"
      .NameFarEast = "MS Pゴシック"
      .NameAscii = "Times New Roman"
      .Size = Esz
      .Bold = msoFalse
      .Italic = msoFalse
      .Underline = msoFalse
      .Shadow = msoFalse
      .Emboss = msoFalse
      .BaselineOffset = 0
      .AutoRotateNumbers = msoTrue
      .Color.SchemeColor = ppForeground
    End With
  End With
  ActiveWindow.Selection.ShapeRange.Rotation = 180#
End Sub
' 文字描画サブルーチン
Sub PrintStrings(x As Single, y As Single, S As String)
  ActiveWindow.Selection.SlideRange.Shapes.AddLabel( _
    msoTextOrientationHorizontal, x, y, x + 10, y - 5).Select
  ActiveWindow.Selection.ShapeRange.TextFrame.TextRange _
    Characters(Start:=1, Length:=0).Select
  With ActiveWindow.Selection.TextRange
    .Text = S
    With .Font
      .NameOther = "Times New Roman"
      .NameFarEast = "MS Pゴシック"
      .NameAscii = "MS Pゴシック"
      .Size = 10
      .Bold = msoFalse
      .Italic = msoFalse
      .Underline = msoFalse
      .Shadow = msoFalse
      .Emboss = msoFalse
      .BaselineOffset = 0
      .AutoRotateNumbers = msoTrue
      .Color.SchemeColor = ppForeground
    End With
  End With
End Sub
' 折れ線グラフ描画サブルーチン
Sub DrawGraph(x As Single, y As Single, data() As Single, n As Integer, _
  Dmax As Single, Dmin As Single, red As Integer, green As Integer, _
  blue As Integer, ErrData As Single)
  Dim i As Integer
  Dim k As Integer
  Dim m As Integer
  Dim flag1 As Integer
  Dim flag2 As Integer
  k = 0
  flag1 = 1
  For i = 1 To n
    If data(i) < ErrData Then
      k = k + 1
      If i = n Then
        Call DrawPolyLine(x, y, flag1, data, k, Dmax, Dmin, _
          red, green, blue)
      End If
    Else
      If k >= 2 Then
        Call DrawPolyLine(x, y, flag1, data, k, Dmax, Dmin, red, _
          green, blue)
      End If
      k = 0
    End If
    If k = 1 Then
      flag1 = 1
    End If
  Next i
End Sub
' 多角形線分描画サブルーチン
Sub DrawPolyLine(x As Single, y As Single, m As Integer, data() As Single, _
  n As Integer, Dmax As Single, Dmin As Single, red As Integer, _
  green As Integer, blue As Integer)
  Dim i As Integer
  Dim myDocument As Object
  Dim pt() As Single
  ReDim pt(n, 2) As Single
  With ActivePresentation.DefaultShape
    .Line.Weight = 0.75
    .Line.DashStyle = msoLineSolid
    .Line.Style = msoLineSingle
    .Line.ForeColor.RGB = RGB(red, green, blue)
    .Line.Visible = msoTrue
  End With
  Set myDocument = ActivePresentation.Slides(1).Shapes
  For i = 1 To n
    pt(i, 1) = x + dx * (m + ii - 2)
    pt(i, 2) = y - (data(m + ii - 1) - Dmin) / (Dmax - Dmin) * g_width
  Next i
  myDocument.AddPolyline(pt)
End Sub
' 矢印描画サブルーチン
Sub DrawArrow(x1 As Single, y1 As Single, x2 As Single, y2 As Single, _
  red As Integer, green As Integer, blue As Integer)
  ActiveWindow.Selection.SlideRange.Shapes.AddLine(x1, y1, x2, y2).Select
  With ActiveWindow.Selection.ShapeRange
    .Line.Weight = 0.75
    .Line.EndArrowheadStyle = msoArrowheadTriangle
    .Line.EndArrowheadLength = msoArrowheadShort
    .Line.EndArrowheadWidth = msoArrowheadNarrow
    .Line.ForeColor.RGB = RGB(red, green, blue)
    .Flip msoFlipVertical
  End With
End Sub
' 縦向き線描画サブルーチン
Sub FlowGraph(x As Single, y As Single, deg() As Integer, ws() As Single, _
  n As Integer, red As Integer, green As Integer, blue As Integer)
  Dim xl As Single, yl As Single
  Dim x2 As Single, y2 As Single
  Dim k As Integer
  yl = y - g_width / 2
  For k = 1 To n
    xl = x + dx * (k - 1)
    x2 = xl + 100 * ws(k) * Sin(rnd * deg(k))
    y2 = yl - 100 * ws(k) * Cos(rnd * deg(k))
    If ws(k) < 3# And deg(k) < 365 Then
      Call DrawArrow(xl, yl, x2, y2, red, green, blue)
    End If
  Next k
End Sub
' 風向き線描画サブルーチン
Sub blowGraph(x As Single, y As Single, deg() As Integer, ws() As Single, _
  n As Integer, red As Integer, green As Integer, blue As Integer)
  Dim xl As Single, yl As Single
  Dim x2 As Single, y2 As Single
  Dim k As Integer
  yl = y - g_width / 2
  For k = 1 To n
    xl = x + dx * (k - 1)
    x2 = xl + 2.5 * ws(k) * Sin(rnd * deg(k) + 180)
    y2 = yl - 2.5 * ws(k) * Cos(rnd * deg(k) + 180)
    If ws(k) < 30# And deg(k) < 365 Then
      Call DrawArrow(xl, yl, x2, y2, red, green, blue)
    End If
  Next k
End Sub
' グラフ凡例描画サブルーチン
Sub DrawLineEX(x1 As Single, y1 As Single, x2 As Single, y2 As Single, _
  red As Integer, green As Integer, blue As Integer)
  Dim myDocument As Object
  With ActivePresentation.DefaultShape
    .Line.Weight = 0.75
    .Line.DashStyle = msoLineSolid
    .Line.Style = msoLineSingle
    .Line.ForeColor.RGB = RGB(red, green, blue)
    .Line.Visible = msoTrue
  End With
  Set myDocument = ActivePresentation.Slides(1).Shapes
  myDocument.AddLine(x1, y1, x2, y2).Select
End Sub
' 矢印凡例描画サブルーチン
Sub DrawArrowEX(x1 As Single, y1 As Single, x2 As Single, y2 As Single, _
  red As Integer, green As Integer, blue As Integer)
  ActiveWindow.Selection.SlideRange.Shapes.AddLine(x1, y1, x2, y2).Select
  With ActiveWindow.Selection.ShapeRange
    .Line.Weight = 0.75
    .Line.EndArrowheadStyle = msoArrowheadTriangle
    .Line.EndArrowheadLength = msoArrowheadShort
    .Line.EndArrowheadWidth = msoArrowheadNarrow
    .Line.ForeColor.RGB = RGB(red, green, blue)
    .Flip msoFlipVertical
  End With
End Sub

```